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# The American Statistician

*A Publication of the American Statistical Association*

FEBRUARY 1955  
Volume 9, No. 1

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Ernest Rubin

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### EDITOR'S NOTE

Beginning with this issue certain  
changes have been made in the format  
of the cover of *The American Statis-  
tician*, to insure greater legibility. The  
color of the cover will be yellow for all  
issues and the type-size has been in-  
creased for the table of contents.

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# NEWS

New ASA Officers—New Section Officers—Summer Sessions—New Publications

## New ASA Officers for 1955

The Committee on Elections reports the following officers were elected as a result of the balloting of the membership last November:

*President-elect:* Gertrude M. Cox  
*Vice President (1955-57):* John W. Tukey  
*Directors (1955-57):*  
Churchill Eisenhart  
Alfred N. Watson  
*Representative-at-Large (1955-56):* Harry Alpert  
*District Representatives (1955-56):*  
*Northeastern:* Murray Dorkin  
*Eastern:* William J. Carson  
*Southeastern:* Conrad Taeuber  
*North Central:* Horace Norton  
*South Central:* J. R. Stockton  
*Western:* William O. Jones

## Sections Elect Officers

The following were elected officers of the **Business and Economic Statistics Section** of the ASA for 1955 as a result of the mail balloting:

*Chairman-Elect:* Kenneth B. Williams, Federal Reserve System  
*Vice-Chairman for Program:* Geoffrey H. Moore, National Bureau of Economic Research  
*Vice-Chairman for Publications:* Walter F. Ryan, U. S. Bureau of the Budget  
*Vice Chairman for Regional Activities:* Wesley D. Mitchell, Peoples Gas Light & Coke Co., Chicago, Ill.  
*Secretary-Treasurer:* Robert E. Johnson, Western Electric Co., New York City

The winners in the election held by the **Social Statistics Section** were:

*Chairman-Elect:* Felix Moore, National Heart Institute, U. S. Public Health Service  
*Vice-Chairmen:*  
(1955-57): Philip Hauser, University of Chicago  
(1955-56): Gladys Palmer, University of Pennsylvania  
*Secretary (1955-57):* A. J. Jaffe, Columbia University  
The amendment of the Social Statistics Section Charter changing the terms of the officers to make possible greater continuity in conducting the affairs of the Section was adopted by an overwhelming vote.

Officers for 1955 of the **Section on Training** are:

*Chairman:* John E. Freund, Virginia Polytechnic Institute  
*Chairman-Elect:* P. G. Homeyer, Iowa State College  
*Executive Committee Members (1953-55):*  
D. G. Chapman, University of Washington  
Boyd Harshbarger, Virginia Polytechnic Institute  
Rutledge Vining, University of Virginia

## Executive Committee Members (1954-56):

G. L. Edgett, Queen's University, Kingston, Canada  
Fritz Kafka, Chas. Pfizer & Co.  
Paul Irick, Purdue University

Officers for 1955 of the **Biometric Section** are:

*Chairman:* Paul G. Homeyer, Iowa State College  
*Chairman-Elect:* I. D. J. Bross, Cornell University Medical College  
*Secretary:* Virgil Anderson, Purdue University  
*Committee Members:*  
G. A. Baker, University of California  
B. M. Bennett, University of Washington  
B. G. Greenberg, University of North Carolina  
Donald Mainland, New York University

## Developments on Standards for Statistics

Several local chapters have held or plan to hold meetings on the question of whether the American Statistical Association should undertake the development of standards for the statistical profession. Other chapters are planning to conduct opinion polls of their members.

A special evening meeting was devoted to the subject by the Albany Chapter, followed by two luncheon meetings—the first for a small group of technicians, the second for a small group of administrators. Most of those present at the special meeting thought it desirable to formulate technical and ethical standards in the areas outlined in the report of the Ad Hoc Committee on Statistical Standards. There was some sentiment for replacing the term “standards” by “recommendations” in view of the variations among localities and the degree of refinement of minimum acceptable methods and practices. Moreover, some of those who considered this a worthwhile activity for the ASA regarded it as having low priority compared to other desirable programs. The elaborate and expensive job done on the production and promulgation of a code of standards by the American Psychological Association was cited as an illustration of the magnitude of such an undertaking. Considerable discussion was devoted to formulation and implementation of standards. The latter, in particular, was a serious issue in the minds of those present, and inspired such comments as:

- (a) Individual members cannot guarantee the effectiveness of a code of standards,
- (b) there is a wide area of unenforceable standards,
- (c) our organizational superiors may not wish to release the data and results of certain studies,
- (d) it is the Association's duty to bring the obligation of publication to the attention of organizational superiors,
- (e) the problem of implementation should be studied simultaneously with the formulation of standards,
- (f) how can the statistician get into the problem early enough to insure the selection of methods which meet professional standards?



(g) perhaps joint action with other professional organizations is a route to the problem of implementation.

The Boston Chapter plans to follow up the poll of its members described in the December *American Statistician* with a questionnaire presenting five choices:

(1) To do nothing, (2) to develop something like the Ten Commandments for statisticians, (3) to draw up a set of standards for procedure and technique similar to those published by the Bureau of the Budget as "Standards for Publication of Statistical Data" (1947) and "Standards for Statistical Surveys" (1952), (4) to draw up a set of standards as in (3) above and to illustrate them by cases of good and bad practice, (5) to go as far as the American Psychological Association did as described in the report of Dr. Likert's Committee.

The Central Indiana Chapter is circulating a questionnaire similar in part to that of the Boston Chapter but going beyond it in asking for suggestions as to types of statistical activity (census or sample surveys, experimental research, industrial statistics), and stages of statistical activity (procurement of data, analysis, and publication) for which standards should be developed.

The Denver Chapter heard an interesting talk by Professor Edward Bryant of the University of Wyoming on the subject of Statistical Standards. Professor Bryant raised the question of the meaning of the term, which sometimes is used to refer to standards of training, at other times to standardization of techniques, and at still others to ethical standards. He suggested that the standards for different classes of statisticians might have to be different. One possible classification, based on type of service, might be: public statistician, private statisticians employed by a company, and consultants. The Chapter has also established a Committee on Statistical Standards, of which George Bardwell is chairman.

A panel discussion on formulation of statistical standards was held by the Oklahoma City Chapter. Members of the panel were Professor F. R. Cella of the Bureau of Business Research, Oklahoma University, and John H. Norris of Tinker Air Force Base. The point was made that in setting standards there should be gradations of accuracy depending on the situation, and that in reporting statistics based on samples the sampling error should be indicated. Persons preparing statistical reports should also remember their audience, providing a brief summary which would obviate the necessity of reading the whole of a voluminous report.

The Hawaii Chapter has discussed the problem of setting standards, and has worked with local public agencies in helping them to attain proper standards in several statistical reports. Many of the members favor a national committee which would certify statisticians in the same manner that accountants are chartered and forced to adhere to proper standards of performance. A local committee has been appointed to work with the National Ad Hoc Committee to Explore Opinion on Standards. Other chapters are planning to hold meetings, or have appointed committees to consider the subject of statistical standards.

### **New ISI Journal of Abstracts on Statistical Methods in Industry**

The International Statistical Institute has begun publication of a new periodical, the "International Journal of Abstracts on Statistical Methods in Industry." The

first issue of this journal, which is to be published three times a year, was for April 1954.

Each issue consists of about 100 abstracts of books and papers on the application of statistical methods in industry and technology published in all parts of the world. Under each title is included a short description of the paper or the book; whether it is theoretical or applied, original or expository; the field of application (if any); whether it is a general survey or deals with specific examples; whether numerical data are given; the particular statistical techniques dealt with; etc. Subjects covered include applications of statistical methods to problems of industrial production—known variously as industrial statistics, engineering or technological statistics, quality control, and statistics for management; and application of statistics to market research, sales administration, industrial psychology and personnel administration—provided the papers have a practical interest and are based on statistical methodology. Theoretical papers that have direct industrial and engineering applications are included. The abstracts are in English or French, and the address of the author when this is known is given. They are printed on one side of thin cardboard, three to a page, so that they can be cut into 3" x 5" cards and put into an index.

The journal is being published by the International Statistical Institute under the auspices of its Committee on Statistics in Industry and Technology. Officers of the committee are W. A. Shewhart (U.S.A.)—President, L. H. C. Tippett (Great Britain)—Chairman, and H. C. Hamaker (Netherlands)—Secretary.

The General Editor of the journal is Professor Grant I. Butterbaugh of the College of Business Administration of the University of Washington. In addition to being President of the Seattle Chapter of ASA, Dr. Butterbaugh is a Fellow of the American Society for Quality Control, Representative of its District comprising sections in Seattle, Portland, San Francisco, Salt Lake City, Los Angeles, San Bernardino, San Diego, and Tokyo, Japan. He is also on the Education and Training Committee, and the Administrative Applications Technical Committee of the A.S.Q.C. He has published two comprehensive annotated bibliographies of quality control literature covering the period from 1924 to June 1949 which are standard references in this field.

The abstracts are prepared by Regional Editors and abstractors in various countries. The Regional Editor for the U. S. is Charles A. Bicking, Research and Development Division, Office of the Chief of Ordnance, Department of the Army, Washington, D. C.

The "International Journal of Abstracts on Statistical Methods in Industry" may be ordered from the International Statistical Institute, 2 Oostduinlaan, The Hague, Netherlands. The subscription price is \$2.50 per year.

### **Southern Cooperative Graduate Summer Sessions in Statistics**

The University of Florida, North Carolina State College, Virginia Polytechnic Institute and the Southern Regional Education Board are jointly sponsoring a series of cooperative summer sessions in statistics.

The first of these cooperative graduate summer sessions was held during the summer of 1954 at Virginia Polytechnic Institute. At this session there were 89

students from 26 states and the District of Columbia and from India, Finland, Canada, Australia, China, Hawaii and the Philippines.

The second session will be held at the University of Florida from June 20 to July 29, 1955. A session is scheduled to be held at North Carolina State College in 1956, and another at Virginia Polytechnic Institute in 1957. The summer sessions are designed to carry out a recommendation of the Southern Regional Education Board's Advisory Commission on Statistics, on which the three institutions initiating the program are represented. The sessions will be of particular interest to (1) research and professional workers who want intensive instruction in basic statistical concepts and who wish to learn modern statistical methodology; (2) teachers of elementary statistical courses who want some formal training in modern statistics; (3) prospective candidates for graduate degrees in statistics; (4) graduate students in other fields who desire supporting work in statistics; and (5) professional statisticians who wish to keep informed of advanced specialized theory and methods.

Each of the summer sessions will last six weeks and each course will carry approximately three semester hours of graduate credit. The program may be entered at any session, and consecutive courses will follow in successive summers. The summer work in statistics may be applied as residence credit at any one of the cooperating institutions, as well as certain other institutions, in partial fulfillment of the requirements for a master's degree. The catalog requirements for the degree must be met at the degree-granting institutions. Each doctoral candidate should consult with the institution from which he desires to obtain the degree regarding the applicability of the summer courses in statistics.

The faculty for the 1955 session at the University of Florida will include: Professor R. L. Anderson, North Carolina State College; Professor D. B. Duncan, University of Florida; Professor Boyd Harshbarger, Virginia Polytechnic Institute; Professor Carl E. Marshall, Oklahoma A. and M. College; Professor Herbert A. Meyer, University of Florida; Professor George E. Nicholson, Jr., University of North Carolina; Professor Phillip J. Rulon, Harvard University; Professor Walter L. Smith, University of North Carolina; and Professor Dudley E. South, University of Florida. Courses to be offered this summer are: Statistical Methods I, Statistical Methods II (Design of Experiments), Statistical Theory I, Statistical Theory II (Inference and Least Squares) Advanced Analysis I, Theory of Sampling, Theory of Statistical Inference, Mathematics for Statistics, Statistical Research in Education and Psychology and Seminar on Recent Advances in Statistics.

The total tuition fee will be \$35 for the six-weeks term. The holder of a doctorate degree, upon acceptance, may register without the payment of any tuition fee. Inquiries should be addressed to:

Professor Herbert A. Meyer  
Statistical Laboratory  
University of Florida  
Gainesville, Florida

### Summer Institute in Survey Research Techniques at Ann Arbor

For the eighth consecutive year, the Survey Research Center of the University of Michigan will hold its Annual

Summer Institute in Survey Research Techniques. The dates for the regular session are July 18 to August 12, with introductory courses offered from June 20 to July 15.

This special program is designed to illustrate the theory and application of survey research to such fields as business and human relations, psychology and sociology, political behavior, public affairs, public health, economics, statistics, etc. Again this year a special workshop will be offered in the practical application of survey research methods to these individual fields. For further information please write to the Survey Research Center, University of Michigan, Ann Arbor, Michigan.

### New ISI Members

Twenty-three candidates were elected to ordinary membership in the International Statistical Institute in 1954. Among these were the following from the United States: Morris H. Hansen, U. S. Bureau of the Census; Erich L. Lehmann, University of California; and W. Allen Wallis, University of Chicago. Other members of the American Statistical Association who were elected to ISI are: Francisco Brambilla (Italy), C. H. Goulden (Canada), H. O. Hartley (United Kingdom), Giovanni Lasorsa (Italy), Patrick J. Loftus (United Kingdom), Tulo H. Montenegro (Brazil), and N. S. R. Sastry (India). President Einaudi of Italy was elected an honorary member.

### Tables of the Cumulative Binomial Probabilities

A limited number of copies of an Ordnance Corps publication, "Tables of the Cumulative Binomial Probabilities," are now available to the public. These tables were prepared in 1952 in the Ballistics Research Laboratories, Aberdeen Proving Ground, Maryland, under the direction of Brigadier General Leslie E. Simon and Dr. Frank E. Grubbs. They are very comprehensive, the volume being printed in large format and having 577 pages, including a short introduction on the nature and importance of the function tabulated. The volume is being distributed by the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. at the price of \$6.00 per copy.

### Econometric Society and Cowles Commission Move to Yale

The headquarters of the Econometric Society were moved from the University of Chicago to Yale University on January 1st. The new post office address is Box 1264, Yale Station, New Haven, Connecticut.

The Cowles Commission for Research in Economics is to move to Yale on July 1st. Established in 1932 by Alfred Cowles and his family, it has been located at the University of Chicago since 1939. With the move to New Haven, the name will be changed to the Cowles Foundation for Research in Economics at Yale University. James Tobin, Associate Professor of Economics at Yale, will become Director of Research. Two leading members of the present Commission, Tjalling C. Koopmans and Jacob Marschak, will be on the Yale faculty as professors of economics.

# FEDERAL STATISTICAL ACTIVITIES

## Evaluation of Available Statistics in Selected Areas

Five task groups composed of independent experts from business and academic circles have been organized by the Board of Governors of the Federal Reserve System to evaluate available statistical information in the fields of savings, inventories, and consumer and business expectations. The task groups have been organized in response to the request last summer of the Subcommittee on Economic Statistics of the Joint Committee on the Economic Report that Federal Reserve, in cooperation with executive agencies, explore the adequacy of present statistics in these basic areas, with a thorough review of concepts, existing data, sources, and procedure for improving the statistics.

After considerable study of the matter and consultation with the staff of the Joint Committee, the Office of Statistical Standards in the Bureau of the Budget and interested executive agencies, the Board determined that it could make the most valuable response to the Subcommittee's request by organizing committees of experts. The five committees and their members are:

### *Committee on Savings Statistics*

Raymond Goldsmith (chairman)—National Bureau of Economic Research  
Simon Kuznets—Johns Hopkins University and National Bureau of Economic Research  
James J. O'Leary—Life Insurance Association of America  
Roy L. Reiersen—Bankers Trust Company  
Edward Shaw—Brookings Institution and Stanford University  
Dorothy S. Projector (secretary)—Federal Reserve Board

### *Committee on Consumer Expectations*

Arthur Smithies (chairman)—Harvard University  
Guy H. Orcutt—Harvard University  
Samuel Stouffer—Harvard University  
James Tobin—Yale University and Social Science Research Council  
Hazel Kyrk—University of Chicago (retired)  
Harold C. Passer—Eastman Kodak Company  
Vernon G. Lippitt (secretary)—Harvard University

### *Committee on Inventory Statistics*

J. Frederic Dewhurst (chairman)—The Twentieth Century Fund  
Lester Kellogg—John Deere & Co.  
Moses Abramovitz—Stanford University and National Bureau of Economic Research  
Joseph K. Heyman—The Trust Company of Georgia  
Mrs. Ruth Mack—National Bureau of Economic Research  
William H. Shaw—E. I. duPont de Nemours  
Arthur L. Broida (secretary)—Federal Reserve Board

### *Committee on General Business Expectations*

Martin Gainsbrugh (chairman)—National Industrial Conference Board  
Orin E. Burley—University of Pennsylvania  
Sanford Parker—Fortune Magazine  
Ashley Wright—Standard Oil Company of New Jersey  
Elmer Bratt—Lehigh University  
Albert Hart—Columbia University  
Millard Hastay (secretary)—National Bureau of Economic Research

### *Committee on Plant and Equipment Expenditure Expectations*

George Terborgh (chairman)—Machinery and Allied Products Institute  
Walter Hoadley—Armstrong Cork Co.  
Irwin Friend—University of Pennsylvania  
Miles L. Colean—Consulting Economist, Washington, D. C.  
William Butler—Chase National Bank

Paul Simpson (secretary)—Federal Reserve Board

Each committee has been asked to make a comprehensive review and appraisal of existing data in its assigned field, including consideration of the purposes for which the data are being or should be used, relations to other data, and long-term as well as short-term objectives. The committees are also requested to consider the effects which recent technical advances in data collection, processing and analysis may have in making possible improved statistical programs, and to make recommendations for improvements in concepts, methods and statistics. They are not being asked to make any recommendations concerning agency responsibilities for providing data.

The target date for completion of the committee reports is June 30, 1955. The Director of the Division of Research and Statistics will serve as the Board's liaison with the committees, and cooperation with the committees is promised from the Federal Reserve research staff and from the Federal agencies concerned.

RALPH A. YOUNG, *Director,*  
*Division of Research and Statistics,*  
*Board of Governors of the*  
*Federal Reserve System*

## Tabulation of Data from 1950 Survey of Consumer Expenditures

The Bureau of Labor Statistics, in cooperation with the Wharton School of Finance and Commerce of the University of Pennsylvania, is now engaged in a comprehensive program of summarizing and tabulating the results of the BLS Survey of Consumer Expenditures in 1950. This program has been made possible through a grant of funds to the Wharton School by the Ford Foundation. In addition to the series of general purpose statistical tables that will be prepared by the BLS, the funds will be used by the Wharton School to prepare a series of monographs on consumer behavior; to provide teaching materials for use by the University of Pennsylvania and elsewhere; to conduct seminars and conferences on consumption economics; and to provide fellowship assistance for selected graduate students in this field of study.

The tabulation program will extend over a period of about two years, with the first release of tabulations scheduled for the summer of 1955. Summary data for all families combined will be presented for each of the 91 representative cities included in the survey; and for the 50 largest cities and 9 classes of cities summary data will be presented for various classes of families—by income level; by family size; by age, education and occupation of the family head; and by other selected characteristics. Detailed information on average expenditures, percent of families reporting purchases, prices paid, and



quantities purchased will be shown for specific items of goods and services. Considerable information by class of family will be shown for inventories of consumer durables; and tabulations showing average change in specific items of assets and liabilities, and average income by source, will also be included in the tabular series.

A list of descriptive titles of tables that will result from this program may be obtained from the Bureau of Labor Statistics, Department of Labor, Washington 25, D. C.

ABNER HURWITZ, *Division of  
Prices and Cost of Living,  
Bureau of Labor Statistics,  
Department of Labor*

### State Employment 1939-1953 by Industry Division

The Bureau of Labor Statistics has made available summary sheets showing for each State and the District of Columbia monthly employment estimates and annual averages for the years 1939-1953, by industry division. These estimates, prepared to meet urgent needs for long-term comparable data on State employment trends, provide information on past growth characteristics of a State's nonfarm economy useful as a base for evaluating future prospects, data for market research, plant location, and other purposes. The estimates for the earlier years, generally 1939-46, were prepared by the BLS and for the later years by the States cooperating in the current employment statistics program of the Bureau of Labor Statistics and the Bureau of Employment Security.

Copies of these tables as well as additional details may be obtained from Seymour L. Wolfbein, Chief, Division of Manpower and Employment Statistics, Bureau of Labor Statistics (Reference No. 303), Department of Labor, Washington 25, D. C.

DUDLEY E. YOUNG, *Assistant Chief  
for Statistics, Division of Man-  
power and Employment Statistics,  
Bureau of Labor Statistics,  
Department of Labor*

### 1954 National Income Supplement

A comprehensive report on the growth of national income and product since 1929 was released by the Office of Business Economics in November, as the National Income Supplement to the *Survey of Current Business*, 1954 edition. The report contains all the national income statistics of the Office of Business Economics except the annual series on income by States and the distributions of family income by size classes. With these exceptions it supersedes all previously published figures, and the series contained in this volume will be kept up to date in the monthly *Survey of Current Business*.

Previous National Income Supplements were issued in 1947 and 1951. The tables in the new 1954 edition incorporate the results of the first comprehensive review of sources and methods since the initial publication of the national income statistics in the form of an economic accounting system in the 1947 Supplement. The text material in the 1951 report has likewise been reviewed and brought up to date, and a general index has been added. In the preparation of the new estimates, opportunity was taken to rework many of the income and product series for the entire period back to 1929 to reflect additional data sources and improvements in estimating techniques. A special feature is the presentation of constant-dollar gross national product in 1947 prices instead of 1939 prices, as previously used.

Part I of the 1954 National Income Supplement is devoted to a review of economic developments in the 1929-53 period as revealed by the national income and product estimates. Basic trends in the economy are described, with emphasis on the overall growth of national income and output and the shifts in their internal composition. The sharp fluctuations in economic activity which occurred within the period are also reviewed. In Part II, entitled "The Conceptual Framework of National Income Statistics," and Part III, "Sources and Methods," detailed descriptions are provided of the theoretical and statistical basis of the estimates. In Part IV, new estimates of gross national product in constant 1947 dollars are described, along with a discussion of the statistical sources and methods used in developing these figures. These calculations allow for the wide changes in the purchasing power of the dollar, and show the comparative growth of the economy in "real" terms. Part V, the final section of the Supplement, contains more than 50 tables of annual, quarterly, and monthly data.

The 1954 National Income Supplement (249 pages) is available at \$1.50 per copy from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., or from the field offices of the Department of Commerce.

GEORGE JASZI, *Chief,  
National Income Division,  
Office of Business Economics,  
Department of Commerce*

### New Joint Labor-Commerce Publication—"Construction Review"

For a number of years the U. S. Department of Labor, Bureau of Labor Statistics, has been publishing a monthly periodical, *Construction*, and the U. S. Department of Commerce, Business and Defense Services Administration, has been publishing a monthly industry report, *Construction and Building Materials*. Both of these periodicals have contained statistics relating to the construction industry. In the interests of improved public service to all those concerned with the construction industry, and in line with the objective of improving the efficiency of governmental operations, the two Departments have consolidated their separate publications into a new monthly periodical, *Construction Review*.

*Construction Review* begins with the January 1955 issue. It brings together under one cover virtually all of the current statistics pertaining to construction which are compiled by the Federal Government, plus some data from private sources.

Among the major series included in *Construction Review* are the following: Value of new construction put in place, by type of construction and ownership, seasonally adjusted annual rate, and value in 1947-49 prices; new nonfarm dwelling units started, by ownership, location and type of structure; building permit valuation, by class of construction, location, and ownership; contract awards; construction cost indexes; indexes and wholesale prices of selected building materials; union wage scales in the building trades (quarterly); production, shipments, stocks and indexes of production of selected building materials; contract construction employment; and registered apprentices in the building trades. Federal legislation and regulations on construction will be annotated. The publication also will contain articles on specific aspects of construction, including interpretation of trends in activity, as well as the outlook, and reports on special studies. Annual statistical supplements will also be issued.



It is the aim of the two Departments that *Construction Review* serve as a comprehensive and authoritative source of information about the important construction industry. *Construction Review* is on sale for \$3.00 per year (12 issues), or at 30 cents per copy, from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

H. E. RILEY, Chief, Division of  
*Construction Statistics, BLS,*  
*Department of Labor; and*  
WALTER W. SCHNEIDER, Chief,  
*Construction Statistics and*  
*Economics Branch, BDSA,*  
*Department of Commerce*

### Census Current Business Reports

Beginning with the May 1953 report month, the Census Bureau's Monthly Retail Trade Report has provided dollar sales volume estimates of retail trade based on an improved sample design. In addition to being unbiased, permitting the derived data to be measured for reliability in terms of their sampling variabilities, the new sample design incorporates the following major changes from the previous sample:

1. It operates in 230 Primary Sampling Units covering approximately 450 counties in the United States, including about 90 of the largest standard metropolitan areas. The previous sample from which monthly estimates of retail sales volume were derived operated in 68 Primary Sampling Units covering approximately 115 counties in the United States.

2. The present sample includes all firms having 11 or more retail establishments. The previous sample included all multiunit organizations which, according to the 1948 Census of Business records, operated 26 or more retail establishments, and a sample of the firms operating between 11 and 25 retail establishments.

As a direct result of the larger sample and improved design, there has been considerable increase in the accuracy of the estimates, thus making possible the publication of additional data. Monthly sales volume estimates at the national level are now published for approximately 15 additional kinds of retail business, which could not be shown in the previous sample because of the relatively high sampling variability. Starting with the December 1953 report month, retail dollar sales volume estimates have been published for selected kinds of business, for the four broad Census Regions. (These data are available in the sample only for firms operating from 1 to 10 retail establishments. Firms operating 11 or more retail establishments are excluded from the regional estimates because these multiunit organizations report a combined sales figure monthly for all retail locations in the United States.)

Other data now included in the Monthly Retail Trade Report as a result of the improved sample design are: Monthly sales estimates by selected kinds of business for firms operating 4 or more retail establishments; Weekly sales estimates of grocery firms operating 11 or more retail stores; and Month-to-month percentage changes in sales for 80 of the Primary Sampling Units for total retail trade (firms operating from 1 to 10 retail establishments) in these areas.

PAUL SHAPIRO, Business Division,  
*Bureau of the Census,*  
*Department of Commerce*

### 1954 Statistical Abstract of the United States

The 1954 edition—the 75th anniversary edition—of the *Statistical Abstract of the United States* was issued by the Bureau of the Census last November. As in the past, the Abstract summarizes a large mass of data, mostly annual, on economic, social and political subjects, from governmental and private sources. Most of the data are national in scope, but there are many tables which present statistics by regions and States and a few tables with data for individual cities and metropolitan areas.

Current statistics appearing in the Abstract for the first time in the 1954 edition include:

Projections of the population to 1975  
Population and characteristics, by race  
Children born per 1,000 women  
Aliens reporting, by nationality  
Illiterates, by selected characteristics  
Women in manufacturing industries  
Korean battle casualties  
Social welfare expenditures  
Characteristics of the aged  
Characteristics of aged recipients of public assistance  
Federal retirement systems  
Community Chest campaigns  
Average family expenditures for selected cities  
National wealth estimates  
Political party composition of Congress, by States  
Circulation of daily and Sunday newspapers  
New books published, by subject  
Postal revenues and expenditures, by class of mail  
Natural gas reserves  
Automobile ownership and financing  
Motor vehicle travel mileage and speed  
Wage scales for able-bodied seamen  
Freight carried on the Great Lakes and Mississippi River  
Farm-to-retail price spreads of farm food products  
Concentration of employment in manufacturing companies, by industry  
Shipments of steel products, by class  
Copies of the 1954 edition, bound in buckram, may be purchased at \$3.75 per copy from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

WILLIAM LERNER, Office of  
*Assistant Director for Statistical Standards,*  
*Bureau of the Census,*  
*Department of Commerce*

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# A SYMPOSIUM ON UNEMPLOYMENT STATISTICS<sup>1</sup>

## SOME QUESTIONS ON THE MEASUREMENT OF UNEMPLOYMENT

FREDERICK F. STEPHAN

*Princeton University*

Less than twenty years ago, after a long period of dispute about various estimates of the number of unemployed workers in the United States that differed by millions, a voluntary registration of fully and partly unemployed persons was conducted by postal workers throughout the country. The purpose of the registration was to obtain information about the characteristics and distribution of the unemployed, as well as an accurate estimate of their numbers. Not everyone was convinced that accurate information about unemployment could be obtained in this way and consequently an enumerative check census of  $1\frac{1}{2}$  per cent of the population was conducted to assay the degree of coverage attained in the registration. The Vice President of the United States drew the sample for the check census. It included 510,000 households.

Shortly after the sample was canvassed for the check census, the level of unemployment in the United States rose rapidly and the data that were obtained from the registration as well as the check census ceased to reflect the current situation. In spite of this unfortunate turn of events, the check census was a great improvement over previous attempts to measure unemployment. Its rapid obsolescence demonstrated once more the importance of measuring unemployment currently rather than at rare intervals.

The voluntary registration itself was valuable as an indicator of geographic distribution and some other questions of detail. As a measure of the prevalence of unemployment on a national basis, however, it revealed

serious weaknesses. Virtually all the unemployed who were in government emergency work programs, 72 per cent of the other unemployed males, 53 per cent of the other unemployed females, and 58 of the partly unemployed mailed back their registration cards. Much more accurate information on a national basis was furnished by the sample enumerative check.

Not very long after the National Unemployment Census was taken, the Works Progress Administration launched a national monthly sample survey of unemployment. This survey was transferred to the Bureau of the Census in 1942 and developed into the Current Population Survey. For more than a decade it has been the primary source of information covering the entire population on unemployment and on employment, migration, income, and other population variables.

The measurement of unemployment has also been improved by the development of better methods of asking the questions that are used to classify the population according to employment and status in the labor force. In addition, there has been a remarkable development of sampling methods. In the light of all this progress, it would seem ungrateful to raise questions about current estimates of unemployment. Nonetheless, we cannot avoid a serious scrutiny of current measurements since, by an ironical development, the progress of the survey forces it upon us.

The most recent efforts at improvement led to a discrepancy of 700,000 in the estimates of the number of unemployed persons given by the old survey and the new one in January 1954. This wide gap was all the more inexplicable and disturbing because both surveys

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<sup>1</sup> The papers in this symposium were presented at the Annual Meetings of the American Statistical Association, Montreal, Canada, September 11, 1954.

used the same methods and shared part of the same sample of households. The principal difference between them was that the sample for the new survey was spread more widely. It was distributed over 230 counties or similar areas, while the older survey covered 68. Why should two surveys of the same subject show a count of the unemployed differing as 76 to 100? This question has been studied by the staff of the Bureau of the Census and by a special advisory committee. The answer appears to be a reassuring one that deterioration of the older survey as it gave way to the new one, rather than any fundamental defect in the methods and the new sample, had brought about the discrepancy that was observed.

The investigation of the causes of the discrepancy left in its wake a renewed concern with the chronic questions of labor force measurement and some new problems. The Budget Bureau has established a committee in the Office of Statistical Standards to review the concepts and approaches used by the Federal Government to obtain statistics of employment and unemployment. The special advisory committee referred to above has recommended a study of a number of problems it could not solve to be made by a broadly representative group not confined to government members. At the risk of muddying the water but in the hope that it may stir some of our profession's able members to think and work on these problems, I will set out some questions without taking time for the explanations and qualifying observations that they deserve.

1. While we have given up the older concept of unemployment in terms of gainful workers who want a job and have debated the proper handling of certain borderline categories of lesser size, have we considered seriously enough the possibility that the concept of unemployment is inherently too diffuse to permit accurate measurement? Is not the present basis of the concept, job-hunting activity, a matter of great variation that tapers off to the more sporadic attempts of school children and retired workers to get some work? Do we need a better scale on which to separate persons who are unemployed from those who are not in the labor force?

2. If the present concept of unemployment can be measured accurately, is it the one we need and want? Can a single concept possibly suffice for all the major needs? Should the user be given the component parts and asked to build his own concept? How can we reduce the misunderstanding and misuse of a standard concept?

3. Assuming that the present category is measurable and the one we need, is it manageable in interviewing in the field? Can it be applied by people who are trained to interview but can not be expected to be experts on all the fringe situations and rare variations that can

not be classified by a modest set of rules and instructions? Does the practice of obtaining data from interviews with members of a household other than the persons who are being classified make the problem too difficult? How should we interpret the results of re-check interviews that show discrepancies between the results obtained by one interviewer and those obtained from the same person by another?

4. How accurate is our present method of measurement? Do we really have a good estimate of its measurement error as well as its sampling error? Can we determine the bias of the method? What degree of accuracy do we need? How important is the level of unemployment compared with the month-to-month or year-to-year change?

5. Do our present measurements provide sufficient detail, such as geographic distribution, industrial and occupational rates, family characteristics, rate of earnings when employed, and summary facts about the individual's work history? Should these detailed estimates be obtained monthly or is it better to make them at less frequent intervals? Are some of these details more appropriate for intensive research studies rather than periodic surveys?

6. Do our estimates link up adequately with data from other sources? Can they be reconciled without forcing the facts out of line? Can we build a bridge between the major sources of employment and unemployment estimates without undue interference with the individual's right to privacy and the essential administrative practices of government agencies?

7. Is it actually feasible to make further improvements given the present operating conditions? Is it worth the effort and cost to do so?

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These questions are easy to ask and hard to answer. Statisticians are frequently pressed to meet demands for estimates that are next to impossible to make within the accepted standards of accuracy and the limitations that various practical considerations impose. This may be the case with the current measurements of unemployment. They do not seem to have sufficient safety margin to meet a critical increase in the difficulties of obtaining accurate data, an increase that might well come when there is an abrupt change in economic activity. Still it is not prudent to have too large a safety factor when this diverts resources from more urgent needs. This is why we can not solve many of the above questions by just spending more money. What is needed is a substantial amount of thorough investigation, skillful research, and ingenious invention, closely tied to the efforts of operating statisticians to maintain and improve the performance of their organizations. This is the approach by which many of the improvements of the past decade have been made. A greater effort is needed now because we are so much farther along.



# UNEMPLOYMENT STATISTICS AND ECONOMIC POLICY USES

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*Bureau of Labor Statistics*

The controversy over the nature and validity of unemployment statistics, which recurs whenever economic activity slackens, is indicative of the role these data are believed to play in public policy. In this paper an effort is made to distinguish between the public response effect and the analytical use of the statistics by technicians and policy-making officials. Perhaps the most pervasive influence of unemployment statistics upon policy results from the impact of the first upon the second: there is no doubt that policy formation is influenced by public opinion on the state of the economy. Some proposals for modification of the character of the official statistics on unemployment are more or less frankly premised on the desire to maximize the response effect in order to stimulate quicker or stronger policy action.

The choice among alternative concepts of unemployment,—for there is obviously no unique definition,—depends upon (1) relevance for policy purposes and (2) feasibility of measurement.

Section I of the paper deals primarily with the rationale of the concept of unemployment used in the current measurement of the labor force by the U. S. Bureau of the Census, and its relevance for major purposes of economic policy.

Section II deals with outstanding questions of measurement other than those of sample design and sampling variability—whether in fact the Census survey succeeds in its purpose of enumerating all persons actually in the labor market with jobs or seeking work.

Section III raises, briefly, a more fundamental question whether labor force statistics measuring labor market attachments under existing conditions of demand bring within the scope of measurement all those persons “able, willing, and seeking to work” described by the Congress as within the scope of national economic policy.

Section IV considers needs for additional information on unemployment, and concludes that more or less additional data of various kinds are needed depending upon the nature of economic policy—whether largely limited to fiscal and monetary policies directed toward stabilizing or expanding aggregate demand or

aimed more directly toward aid to particular groups, industries, or geographic areas.

## I

What unemployment is,—what it is that is to be measured,—needs necessarily to be considered in terms of the economic policy uses of the statistics.

Little explicit instruction is to be found in the language of the 1946 Employment Act. There we find a policy declaration that specifies Federal responsibility for creating and maintaining “conditions under which there will be afforded useful employment opportunities, including self-employment for those able, willing, and seeking to work.” Unemployment is not specifically mentioned. The phrase “able, willing, and seeking to work” is to be read as part of a statement of economic policy objectives, not as a definition or a practical guide to enumerators. The official Census measurement of unemployment is one of many possible approaches to measuring persons “able, willing, and seeking to work.” The question is which concept or measurement of unemployment is most appropriate and useful for national economic policy objectives.

Economic policy has many aspects but it is primarily concerned with problems of economic stability and growth, particularly those connected with fluctuations in the level of business activity and the productive use of economic resources. In terms of the employment aspects of economic policy, two major interests may be distinguished: reduction of unemployment attributable to lack of demand by stabilizing or enhancing demand, and reducing frictional unemployment (i.e., unemployment arising out of labor immobility or other structural rigidities rather than lack of demand) by better organization of the labor market. It is against these kinds of policy objectives, as well as better utilization of the employed work force, that the appropriateness of alternative concepts for measuring unemployment needs to be examined.

From this viewpoint, the curious fact about the current measure of unemployment is it provides no count of the so-called frictionally unemployed. To the degree



it is possible to identify the unemployed in these terms, rarely possible on an individual basis, a not inconsiderable part of the frictionally unemployed are in fact classified as employed. Some portion of persons on temporary layoff and workers waiting to report to a new job certainly meet common criteria of frictional unemployment. However, this is not too serious a shortcoming.

Any particular conception of unemployment focuses attention on a special aspect of the phenomenon. The essential criterion of the present definition of unemployment is joblessness. In the minds of the innovators of the series, in the Division of Research of the Works Progress Administration, the most striking differentiation in labor market status was that between having a job and not having a job. With this as a starting point, persons with a proximate relationship to the labor market are classified in terms of their competition for available jobs. In this scheme the employed are defined as those with a job, whether working in the enumeration period or not (provided they were not seeking another job); and the unemployed are differentiated from the remainder of the population on the basis of their seeking work.

Obviously such a single figure on total unemployment can not serve all purposes. To some extent the shortcomings of the conception, or the need for other data, are met by component detail obtained and published as part of the same survey process, or other data. But these data may not be examined by persons who draw inferences from what is published as total unemployment. This is the reason why technicians and interested groups in business and labor are preoccupied with the general definition used for the global figure.

Common sense may be affronted by the exclusion of certain groups, including part of what ordinarily is regarded as frictional unemployment, from the unemployed total. The fact is the total unemployment series is not an all-purpose index. It does not provide a measure of the failure of the economy to utilize all the man-hours of labor available in the labor market or potentially available, nor is it the most sensitive index of changes in the demand for labor.

The rationale of the present unemployment measurement, however, is apparent. What it depicts is changes in the number of persons without jobs because of fluctuations in demand or changes in the number of persons seeking work. It aims to measure the number of persons who have no claim upon a job to which they attach some confidence, over and above the number of persons who have a claim to a job to which they (and employers, too) attach some reality. The fact that some part of the frictionally unemployed are included and some excluded in the unemployed count does not detract appreciably from its merits as an indicator of cyclical or chronic unemployment.

Employment policy is concerned, as noted, with reduction in unnecessary frictional unemployment and with underutilization, but if its major concerns are economic stabilization and growth, the conception of joblessness underlying the present measurement does not appear inappropriate for a two-way differentiation of the labor force. While the concept focuses attention on complete loss of job attachment, there is no necessary implication that economic policy is concerned only with remedying joblessness. Nor does the concept stand in the way of efforts to achieve more adequate measurement than now of the persons "able, willing, and seeking to work" referred to by legislative policy.

## II

Matters of definition, classification, and the other ground rules of labor force measurement are probably less important than the question how well current data measures what is intended to be measured. This paper is not concerned with technical questions of validity with reference to sample design or estimating procedures, but with the question, at this point, whether the unemployed as defined are in fact measured.

Definition or concept is important primarily because of the desirability of a measurement as suitable as possible for policy purposes and for an informed public opinion on current economic developments. Otherwise whether certain groups are classified one way or another is not too important; the component details are published separately and are available (if not to the newspaper reader, at least to the analyst).

The general effect of different ground rules is to raise or lower the total unemployment figure, by placing persons in one category rather than the other (employed or unemployed), and to make the unemployment figure more or less volatile. If persons with a job but temporarily out of work for economic reasons were classified as unemployed rather than employed, as now, the level of unemployment would average ordinarily about a quarter million higher than under the present rules. The level of unemployment would be further increased if those out of work at the end of the enumeration week, although having worked sometime during the week, were counted as unemployed, or if a single day rather than a week was used as the enumeration period.

The unemployment figures would respond more sensitively to changes in the demand for labor if persons on temporary layoff, although not seeking a job other than the one they have, were counted as unemployed—especially in the early phase of recession. (In this connection it should be noted, however, that those on temporary layoff who are seeking other work, are counted as unemployed.) While less important

quantitatively, the effect of counting those waiting to report to a new job as unemployed would be to reduce the sensitivity of the series to improvements in the employment situation.

It is, of course, impossible to appraise the effect of differences in level or sensitivity of the data on public opinion or policy. To some extent the higher figure would be discounted, as would the increased sensitivity. More if not all of those regarded as frictionally unemployed would be included in the unemployment total, but the estimate of frictional unemployment consistent with full employment would also be raised (there is already a common tendency to identify it with average unemployment during prosperity). Possibly what is called a "tolerable level" would also be raised.

Important as these considerations are for public opinion or economic policy, a more fundamental question is whether all persons who are competing for jobs in the labor market are actually measured. The presupposition is that such persons are within the category of the "able, willing, and seeking to work" who are described by the Employment Act as the objects of legislative policy.

The official statement by the Bureau of the Census describing the Monthly Report on the Labor Force traces the inception of the current measurement approach to the desire to objectivize the identification of unemployed individuals. "The criterion 'willing and able to work,' when applied to specific situations," the statement declares, "appeared too intangible and too dependent upon the interpretation and the attitude of the person being interviewed." And continuing: "the classification of an individual (under the new approach) was to be dependent principally upon his actual activity, i.e., whether working or looking for work, or doing something else, within a designated time period."

For persons who do any work at all in the enumeration period the problem of measurement is not too serious, although the difference in the volume of employment that may result from changes in inquiry design is somewhat surprising. For those on temporary layoff the procedures provide meticulous instructions for determining whether the person is seeking work—hence to be classified as unemployed rather than employed. Not too much is known on how well the instructions are followed.

The serious problems center around the enumeration of the unemployed. Some overt behavior indicative of looking for work is the general requirement. This includes job application, answering ads, registration at the employment service, etc. Two types of exceptions may be noted. The person reporting indefinite layoff or layoff of more than 30 days, from a job to which he expects to return, is probably automatically classified in most instances as unemployed without probing to discover whether or not he is looking. Probably no

significant over-counting of unemployment results because this exception probably applies largely to adult male, industrial workers, who are ordinarily continuously in the labor market. The second major exception is the case of persons who report no work is available in their line of work in their community; it is intended particularly to cover shutdowns, for example, in one-industry towns. Men, particularly, are likely to be counted as unemployed in such situations where the enumerator is conscious of the fact that active looking for work would be futile.

The exception may, but is not likely, to cover seasonal layoffs. One distinction between present labor force measurement and the previous gainful worker concept is that seasonal workers are dropped out of the labor force if not seeking work in the enumeration period. When men engage in seasonal activities and count on no other employment or when women enter employment only to engage in seasonal work with no desire for year-round work, the present surveys are intended to reflect these personal desires or adjustments to employment situations. What is now not known is whether enumerators tend to assume that seasonal workers withdraw from the labor market without probing to discover whether they are seeking another job, thus contributing possibly to a substantial underestimate of those "able, willing, and seeking to work."

These cases bring to the fore differences in definition of unemployment status between Census surveys for statistical purposes and unemployment insurance program operations. In the latter unemployment status is defined by statute and differs somewhat among States. Persons on temporary layoff are ordinarily entitled to benefits. Benefits are also provided for partial unemployment. One common link between the two, however, is that the legal requirement of availability for work comes close to the Census survey requirement of looking for work. Consistency in definition is not always possible, or necessarily desirable, but this common link affords the possibility of closer identity between Census unemployment and insured unemployment.

Lebergott and others have suggested the possibility of using the fact of benefit status as evidence of looking for work in Census surveys. There would be advantages in this even though it would not be a complete solution to the apparent problem of under-reporting in situations of the kind indicated. All workers are not covered by unemployment insurance, benefit rights are exhausted after a time, etc. Some risk is involved in the apprehension that may be raised in the minds of respondents of a connection between the Census survey and the policing of the insurance system. There is the disadvantage, too, of losing the possibility of actually probing for the true attitude of persons with respect to immediate desire for employment. However,

if it were possible to publish component detail on insurance status of the unemployed, together with various other personal and economic characteristics, there would be an important policy use in showing what part of the unemployed is outside the scope of insurance protection for lack of coverage, exhaustion of benefit rights, or other reasons.

### III

Whether the Census measurement provides data on the total number of persons "able, willing, and seeking to work" which the Congress intended to bring within the scope of national economic policy is an even more difficult question than the one we have considered so far: whether Census enumeration measures the total of persons actually in the labor market. The two problems merge closely together. For what makes enumeration difficult, as in the case of the inactive job seekers referred to, is the lack of job opportunity. The merit of the Census approach is that it seeks to identify labor force status by the individual's activity and attitudes related to having a job or seeking work in a specific period of time under existing labor market conditions. Test surveys have shown that persons at the borderline of the labor force, excluded by present procedures, have only tenuous and tentative attitudes toward seeking work. This, however, is not directly relevant to our question—namely, whether some substantial portion of these persons would be active job seekers under conditions of higher effective demand.

Interpreting Congressional intent on this problem is perhaps impossible, but the question is fundamental to our basic question of what kind of unemployment statistics are appropriate for national economic policy purposes. Not only in war emergency periods is there occasion for inquiring whether human resources are as fully utilized as the people who make up the human resources would like to be. This is not advocacy of inflationary over-employment. What may be inflationary in the short-run may be quite different if the structure of production is adapted to a higher level of demand and work force. There is no special virtue to a particular demand situation to which labor supply is more or less perfectly adapted, in which there is only frictional unemployment and no inflationary pressures, except that it represents a balanced situation to which structural factors are adjusted.

The question is essentially one of legislative policy. Measurement may not be easy or possible. Persons who now define themselves as not seeking work in realistic recognition that jobs are not available, are difficult to identify. But if in fact it is legislative policy to attempt to achieve "maximum production, employment, and purchasing power" (in the language of the Employment Act), a statistical measure of

unemployment bottomed on current demand may do that policy a grave disservice.

### IV

More detailed data on unemployment are sought, primarily for use by analysts, for better insight on the nature of current economic developments and for consideration of remedial action. There are important gaps in the statistics, but more data are in fact available than sometimes realized. Some of the small components of the national survey data suffer, however, from a high degree of sampling variability which limits their use. Jaffe and others have suggested the possibility of curtailing the frequency of the surveys to finance reduction in sampling variability. This proposal has merit if there is a fixed limit on budget. Recent experience in the United States, however, suggests it is undesirable to put the comprehensive measurement of unemployment on less than a monthly basis. Both the gaps and the weaknesses of the detailed statistics could possibly be better overcome by systematic exploitation of available data and occasional inquiries directed to specific problems.

One proposal that appears in various forms is that the unemployed should be differentiated according to family status or, sometimes, according to whether they are "primary" or "secondary" members of the labor force not continuously attached to the labor force. Who the unemployed are, is important. The heavy impact of unemployment upon men 25-54, typically family heads, as in the downswing of 1949-50 and 1953-54, which we know from available data, is a significant fact for social and economic policy.

But the emphasis sometimes placed on the significance of this differentiation of the unemployed has certain policy implications that appear inconsistent with current policy objectives. In its crudest form the implication is that Federal responsibility extends only to maintaining an economy providing employment opportunities for primary breadwinners. There is also a certain naivete in the emphasis upon a differentiation, supposedly with relevance to public policy, that slights the role of so-called secondary workers in the American economy and the present social and economic status of women.

What kinds of additional data are necessary for policy purposes depend in part upon what kinds of policy actions are deemed appropriate or feasible. If, for example, national economic policy is largely in the field of fiscal and monetary measures directed toward stabilizing or expanding aggregate demand, the need for additional data may be limited to information that facilitates interpretation of the current economic situation, the timing of policy actions. On the other hand, if governmental intervention is of a kind that



deals directly with economic distress affecting particular groups, industries, or geographic areas, data needs are multiplied.

Statistics on employment, hours, earnings, and turnover based on establishment reports, together with State and local data on insured unemployment, provide much of the data necessary for analysis of developments on an industrial and geographic area basis. Expansion, improvement, and more intensive exploitation of these data would meet many needs complementary to those served by data on individuals from

household surveys, especially in relation to unemployment problems with an industry or area orientation. Beyond this, in any case, it would seem desirable to have additional data, from a combination of sources, relevant to the qualitative performance of the economy. Not the least is the need for data bearing on the breach between actual utilization and the capacities and desires of individuals, a policy problem suggested by the President in his message to the Congress on the Reorganization of the Council of Economic Advisers in 1953.

# THE RELIABILITY AND MEANING OF EMPLOYMENT AND UNEMPLOYMENT STATISTICS

## DISCUSSION

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Perhaps a basic question in the discussion of labour force measurement is whether or not we should attempt to provide a statistic labelled "the unemployed". As has been indicated there seems to be no unique definition of this term. It is not so much the definition of unemployed but its topical meanings that arouses confusion and misunderstanding. The term "unemployed" means one thing to John Smith and something completely different to Joe Doakes. If a statistic on unemployment were to be used by but one or two persons or organizations the problem of definition would be simplified. If, for example, we were to provide a statistic for the general public which was not needed for analysis we might merely ask of respondents whether they were employed or not; the resulting measure would be based on the concepts each individual held respecting unemployment. However, because a large number of persons and organizations use the data any one definition will prove satisfactory to but a proportion, and often not a sizable proportion, of the users.

In the Canadian Labour Force Survey we have intentionally side-stepped the term "unemployed". Since 1949 we have not used either of the terms "employed" or "unemployed" with respect to labour force categories. Essentially the core of the unemployed is categorized

as "persons without jobs and seeking work" but, dependent on the problem at hand, there may be other fringe components which should be added to this central figure to provide a suitable measure.

It is within two other classifications "persons at work" and "persons with jobs but not at work" that the major fringe components of the unemployed will be found. Because of this we have extended the classification of "persons at work" to provide estimates of the number of persons who work more or less than a stipulated average work week, for our purposes taken as 35 hours. For those who worked less than this norm the data is tabulated by the reason they worked less than 35 hours. For example, estimates are made of the numbers that worked less than 35 hours because they were laid-off for part of the week, or lost their job or found a job during the week, those whose reason was inclement weather, illness, industrial dispute, or vacation. For "persons with jobs but not at work" similar estimates are made for those who usually work 35 hours or more per week. These additional classifications increase the problems associated with lengthened interviews but provide data on components, some of which would be combined with "persons without jobs and seeking work" to estimate or approximate for dif-



fering definitions of the unemployed.

Even with our side-stepping a definition of unemployed and using more explicit sub-categories, we too are worried and inquisitive about whether or not we actually measure the categories we have defined. It is in this field of inquiry that much research is yet to be done. Re-enumeration has been used to determine how effectively the explicit definition of temporary lay-off has been followed and we have determined that in our survey this definition has been overly extended. Continuous prodding on the adherence to the definition has resulted in some improvement but the category of temporary lay-off is so small that an enumerator seldom meets a true case. Excessive emphasis on this group may, perchance, encourage the enumerator to "force" respondents into this definable category.

One of the more difficult classification problems is with the fringe or marginal classes of the labour force. Intuitively it could be expected that if additional probing and leading questions were asked, a number of individuals, originally classified as "non-workers", could be re-classified into a lesser degree category of "looking for work". Such a survey could provide an indication of the types and volume of border-line cases and their importance judged on the basis of the uses of the resulting statistics. In a survey restricted to the Canadian Capital, Ottawa, an attempt was made to obtain information on the degree of availability for employment of the non-working population. After the regular Labour Force Survey was completed a second

independent interview was made of those persons originally enumerated as "not working". They were asked if they would be willing to accept part-time or full-time employment. Of those who answered "yes", additional questions were asked about their attempts to find work or their reasons why they had not looked for work. Seventy-six out of the 575 answered "yes" to this supplementary questionnaire and of these 76, 18 had originally been classified as "seeking work". An analysis of the remaining 58 indicated that the majority of cases involved married women interested in part-time work who had not actually looked for a position and, had one presented itself, it would be doubtful whether they would take it or not. Satisfactory positions for this group of respondents were in many cases as fanciful as the one required by the person who answered an advertisement of a British Columbia firm in regard to raising miniature trees at home. The few cases of males were in the very young and very old age groups. This survey and its results are illustrative of the power of definition.

If I have added anything to this discussion it is to raise the question should we provide a statistic labelled "unemployed". We concur that there is no satisfactory universal definition and that if a definition is used it could be and is misinterpreted. We propose instead the measurement of explicitly defined components and place the onus on the user to group these components to provide a meaningful measurement for his own problem.

## DISCUSSION

In his challenging paper, Charles Stewart has performed a useful service by drawing attention to several limitations of the present Census measure of unemployment, such as its failure to reflect all frictional unemployment, the fact that it primarily measures unemployment bottomed on current demand and does not fully portray that group among the jobless who may be discouraged from an active search for work because of alleged lack of job opportunities, and its inability to measure the number of man-hours of human labor available or potentially available for use. The limitations noted by Mr. Stewart did not move him, however, to suggest any reform. Rather, he assumes that the three-way basic classification of our population into the categories of "employed", "unemployed" and "out of the labor force", supplemented as it is by some additional breakdowns, is adequate for public policy purposes.

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A re-examination of some of these basic concepts is nonetheless warranted. When labor force measurement was initiated in the middle thirties, a specific problem confronted the statistician. There was a distinct and definite need to estimate the number of jobless willing and able to work for purpose of determining the allocation of WPA funds to individual communities. In the light of such limited objectives, the technique was worked out to obtain, by means of household inquiries, information which forms the basis of the present day measurement of the labor force—except for a number of technical refinements the basic approach in the United States has remained unchanged to this date. In broad outline, the approach was to describe, on a basis of answers to a limited number of questions, the status of the individual in relation to gainful activity. Classification was determined on the basis of a definite set of priorities. Work or job attachment in

the absence of gainful activity during the survey week was taken as evidence of employment and given first priority for classifying an individual. In the absence of work activity or of job attachment (as spelled out in the procedures), search for work was assigned the the second priority and individuals falling into this group were classified as unemployed together with some others covered by the technical concept of "inactive unemployed". Those outside the first two priorities—the residual group—were classified as outside the labor force.

As the first approximation to the study of gainful activity of the population, the breakdown into three basic groups has considerable merit. And yet, it fails to portray the full character and dynamics of the labor market. Thus, if one wishes to evaluate the extent of existing employment opportunities or of the demand for labor at any one time or over a period of time, the global employment figures, as shown by the Monthly Report on the Labor Force, are prone to be somewhat misleading. The inclusion of those who perform no work during the survey week among the employed, merely on account of alleged job attachments, tends to exaggerate the magnitude of the demand for labor in more ways than one. This can be seen from several examples. An individual who performs work during the early part of a survey week and who is laid off or quits in the middle of the week, is counted as employed. But so is the person hired in the same week as his replacement. Thus, for a single job opportunity, the statistics may provide a double count in the number of persons who fill the job. If bad weather prevents work, the demand for labor is correspondingly curtailed at that time. Yet, individuals prevented from working by bad weather are counted among the employed. If a person who is unemployed during the survey week obtains a job which is to begin subsequently, he, too, may be counted among the employed even though he may have no past history of attachment either to the particular job or to any job. The increased practice of granting or taking vacations, spurs on a demand for temporary replacements. This, too, gives rise to an exaggerated count of persons deemed "employed" as against the number of existing job opportunities. The shift of vacation periods from one period of the year to another, under the influence of general business conditions, also tends to compound this distortion.

Similarly, if one wishes to determine the extent to which idle manpower is available for work, one cannot rely solely on the data on the number of "unemployed" as shown by the Census. Some persons available for work are classified as with jobs although not at work under the broad heading of "employed". Other persons, who would have been available for employment provided job opportunities did exist, may be classified with those out of the labor force. It is only reasonable

to suppose that the size of this latter group does not remain constant and that it changes with the swings of the business cycle, with the shifts in the extent of chronic unemployment (such as one periodically finds in textile and mining communities) and with changes in the personnel policies of business (such as those in the immediate post war period, when female labor was replaced by males in a number of industries and localities). The existing body of survey material, unfortunately, does not provide us with too much information in this regard. While special studies of this group have been undertaken in the past, they were made as a rule during periods of relatively plentiful employment and when the size of this segment of our population might have been expected to be smaller than in the periods of developing depression or at its depth. Nonetheless, even at those times the size of this marginal sector was significantly large in comparison with the number of persons otherwise classified as unemployed.<sup>1</sup>

There can be little doubt that in order to provide answers for different operationally meaningful questions, information regarding the gainful activity or inactivity of our population must be differently presented than under the present Census usage. Broadly speaking, this suggests the abandonment of the present classification scheme based on a priority system which assigns each individual to a single controlling category and its replacement by a multi-purpose classification which would recognize in effect that an individual may be properly classified by more than one attribute which describes his degree of attachment to the labor force and which would recognize the changing patterns of the individual's status within the labor market. For example, in the case of individuals at work, the classification could attempt to distinguish between those who, in the course of a given survey period, were at work and with a job during the entire week, those who resumed work after period of unemployment or after being out of the labor force at the beginning of the survey week, and those at work at the beginning of the survey period though jobless before its end. In the case of persons reported as having had more than a single employer or business in the course of the survey period, a distinction could be drawn between dual jobholdings and changes in job situations. Such data, together with information on the length of time on a given job would provide invaluable data on the changing patterns and

<sup>1</sup> A. J. Jaffe and Charles D. Stewart, *Manpower Resources and Utilization*, p. 460, show, for example, that in the six inquiries on the additional persons who have been classified as seeking work, which were conducted by the Census between 1946 and 1949, they accounted for the following percentage of the corresponding number of unemployed: 73%, 11%, 22%, 20%, 18% and 16%.

dynamics of the labor market as well as on the nature and extent of frictional unemployment.

One of the advantages of the multi-purpose classification would be to remove some undesirable misunderstandings to which the present technical terminology used by the Census Bureau gives rise. It is not infrequent, for example, to find the term "employment" used synonymously with "at work". Such confusion is found not only among the members of the general public, but among policy makers, and statisticians as well. The problem has been recognized for a number of years by our Canadian neighbors, as is excellently brought out by Mr. D. K. Dale's paper. The Canadian usage of classifying population into four groups, "persons at work", "persons with jobs not at work", "persons without jobs and seeking work" and "persons not in the labor force" (with similar breakdown for the first two of these categories), is a proper step toward the development of a multi-purpose classification and goes a long way towards eliminating confusion and clarifying the meaning of the data for a multiplicity of purposes.

One should note, of course, that some breakdown called for by a multi-purpose classification approach is already available in the United States, either in form of breakdowns of the information collected monthly by the labor force surveys or from special supplemental inquiries (such as those on part time workers). However, the data now gathered fails to provide a complete cross section of the population possessing a given secondary characteristic. Thus, special studies of part time workers do tell us how many individuals who normally work full time on their jobs (although not in the course of the survey week) have worked fewer hours because they either started on the new job or else they separated from the old job after the beginning of the survey period. No similar information is available, however, about those who normally work part-time. Nor do we know anything about short time work patterns of part-time workers. We know nothing about job search on the part of workers who either work part-time or full time. Thus, if one is interested, for public purposes, in estimating the pressure on the labor market by job seekers, one has to rely on a partial picture, at best.

The multi-purpose classification approach to the study of labor force must, of course, be supplemented by further investigations of marginal groups who hover at the present time between the economically active and inactive segments of our population. As Mr. Stewart correctly pointed out in his paper, these groups are difficult to isolate and yet the problem is not al-

together insurmountable—the studies made by the Census Bureau in this area amply testify to that.

Similarly, additional studies need to be made of persons who could not be contacted in the course of the enumeration—persons who were not at home at the time the enumerators tried to contact them<sup>2</sup> and persons who were in transit, moving from one location to another at the time when the enumeration was conducted.<sup>3</sup> At the present time it is assumed that labor force characteristics of these two groups are identical with those of persons in the households in which interviews were secured. This, however, is not necessarily so. We do not know, for example, how many migrants relocate in search of job opportunities and whether unemployment among them is greater than among those from whom interviews have been secured. For that matter, we do not even know to what extent the Census fails to contact persons who are on the move in the course of the survey week. Only by developing techniques, through periodic surveys, of determining the characteristics and size of these groups can some light ultimately be thrown on this problem.

The task of reviewing the schematic of classification of the labor force for public policy purposes is a major undertaking. These issues, exemplified by classification, cannot be readily separated from many other collateral problems. Since statisticians do not operate in a vacuum, their ability to produce information is not unlimited. Aside from budgetary considerations (and their importance cannot be minimized) the type of data which can be secured will be limited by the general state of knowledge about the character of the phenomena under study, by the nature of available techniques for eliciting and developing information, by the knowledge possessed by individual respondents as well as by their willingness to supply information, and by the nature and size of the sample design. Answers also will have to be sought to the searching questions posed by Frederick Stephan. However, it is only through such searching inquiries as he recommended that we can hope to ultimately make statistical measurement of the labor force of greater value for public policy formulation.

<sup>2</sup> In the course of an average Census enumeration, some 21,000 households are interviewed while between 500 and 1000 households are not interviewed because their members are temporarily absent or are not at home.

<sup>3</sup> In the year ending in April 1953, the total number of persons who relocated was 30,786,000, according to the Census estimates, or nearly 600,000 persons in the average week.\*



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# SEASONAL COMPUTATIONS ON UNIVAC<sup>1</sup>

JULIUS SHISKIN

Chief Economic Statistician,  
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The Bureau of the Census has introduced new time and cost dimensions into the computation of seasonal adjustment factors and seasonally adjusted time series. Through the use of a high-speed electronic computer, Univac, moving seasonal adjustment factors are computed from ratios to moving averages of the original observations, original observations are adjusted for seasonality by these factors, and several tests of the results are made. These computations are being made at the rate of about one minute for a 10-year monthly series, and at a cost, including the auxiliary operations, of about two dollars. This development starts a fresh chapter in measuring and analyzing all types of economic fluctuations.

The Univac performs arithmetic computations at a very high rate of speed, its checking circuits prevent the propagation of errors, and its operation is almost completely automatic. Computers of this class are at their best in performing operations involving long series of sequential or iterative computations on relatively small numbers of original observations. The computation of seasonal adjustment factors and of seasonally adjusted series fits this requirement very well and, moreover, requires only a small amount of input operations—card punching and card-to-tape conversion. While the output of data is large relative to the input, it does not impose a serious burden upon the present uniprinters and will easily be handled by the Census Bureau's high-speed printer when it is delivered later this year.

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<sup>1</sup> For contributions to the development of the seasonal method described in this paper, the writer is indebted to Arthur L. Broida of the staff of the Federal Reserve System, Geoffrey H. Moore of the National Bureau of Economic Research, and Maxwell R. Conklin of the Bureau of the Census. For help with the sections of this paper dealing with Univac and for supervising the preparation of this Univac seasonal program, the writer is indebted to Lancelot W. Armstrong. The Univac program was written by Edward I. Lober.

For a description of the Univac system (Universal Automatic Computing System) and its method of operation, see "Large-Scale Electronic Tabulating Equipment in Use at the U. S. Bureau of the Census," by James L. McPherson, *Estatistica, Journal of the Inter-American Statistical Institute*, December 1953, Vol. XI, No. 41.

## Present Seasonal Computations

Although any seasonal computations can be made on Univac, the particular method which has been programmed is sufficiently general for application to series with widely varying seasonal patterns. It is an adaptation of the standard ratio to moving average method.<sup>2</sup> This method assumes that ratios of the original observations to a 12-month moving average include the seasonal and erratic components of a series, but not the trend and cyclical components, and that averages of the ratios for each of the 12 months measure the seasonal component alone.

Many refinements have been introduced into the programmed method as compared to methods more commonly used. Thus, the 12-month moving average is centered and the seasonal indexes computed are moving rather than constant. Furthermore, two sets of seasonal indexes and two seasonally adjusted series are computed. The first set of indexes is based upon ratios to the 12-month moving average of the original observations. Since, however, this moving average sometimes provides an inadequate measure of the underlying cyclical movements of a series, a second set of moving seasonal indexes, based upon ratios of the original observations to a 5-month moving average of the first seasonally adjusted series are computed and used to adjust the original observations.

Tests of the existence of a seasonal pattern in the original observations and of the soundness of the seasonal adjustments are also made. First, the original figures for each month are divided by an average of the original figures for the preceding and following months. For each month a random series of variations about 1.00 would be expected to result for series where no seasonal pattern exists. This computation is also made on both seasonally adjusted series. When values above or below 1.00 are found in an adjusted series for a particular month in a number of consecutive years, the adjusted series should be professionally reviewed for residual

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<sup>2</sup> This adaptation may be viewed as a mechanical approximation to the method currently used by the Federal Reserve System and described in the *Federal Reserve Bulletin* for June 1941.

seasonality. Second, an uncentered 12-month moving average of the seasonally adjusted observations is divided by an uncentered moving average of the original observations. This test shows whether the seasonal adjustment has resulted in significant differences between the averages of the adjusted data and the averages of the unadjusted data for any 12-month period.

Besides making the computations, the Univac system will print the results. The present program provides for printing the original and seasonally adjusted figures and data that are useful in judging the validity of the seasonal adjustment. For example, the ratios of the seasonally adjusted figures to the average of the immediately preceding and following figures are printed. These print-outs also include data required to recompute the seasonal adjustments manually where the mechanical techniques are not considered to produce a satisfactory adjustment, or to compute up-to-date seasonal indexes for current months, such as ratios to the moving averages.

Altogether, 19 tables showing the original observations, five different moving averages, two sets of ratios to moving averages, two centered and two uncentered sets of moving seasonal factors, two seasonally adjusted series, and five tests of the work are produced by this method. A fuller insight into the magnitude of these operations, performed at the rate of about one minute for a 10-year monthly series and at a cost of about two dollars, can be gained from an inspection of the print-outs shown for an illustrative series on the pages which follow the text.

The large amounts of information about the series that can be obtained at nominal cost on electronic computers facilitate professional review of the results, provide a means for a better understanding of the behavior of each series, and make possible superior judgments about the validity of the seasonal adjustment.

The present program has already been used to make seasonal computations for about 500 series, and adjustments for many more will soon be completed. These include series compiled by other Federal agencies as well as the Census Bureau. Professional review and analysis of the results is under way in the agencies concerned, and it is expected that many of the adjusted series will be published by the agencies beginning early in 1955.

#### Future Time-Series Computations

The speed, flexibility, and accuracy of Univac combine to create a tool far more powerful than any previously available for time-series analysis. These attributes of electronic computers make possible a larger scale application of present methods and the mass use, of any more refined and elaborate seasonal techniques

that may be developed. Development of new methods of seasonal adjustment—as superior to present methods as the new electronic computers are to standard computing equipment—offers a new challenge to economic statisticians.

The preparation of instructions, or “programs,” for electronic computers requires far more intensive planning and a more meticulous attention to detail than the preparation of procedures for clerical or punch-card processing. Furthermore, it is often true that changes in approach cannot be readily made by the modification of existing programs but require instead the writing of completely new programs. On the other hand, once an instruction tape has been prepared, it will automatically repeat the same operations for all the data that can be entered on a single reel of tape (thousands of years of monthly figures), and can be used indefinitely for additional reels. For this reason, any new method that is adopted should be carefully worked out and thoroughly reviewed before the actual “programming” begins.

If the potentialities of electronic computers are fully exploited, business analysts can soon have available seasonally adjusted series to supplement original observations for most economic series. As a by-product, they can also have moving averages tracing out the underlying movements of these series, and seasonal factors and ratios-to-moving averages for use in making seasonal adjustments of current statistics. Great as is the advance that this will represent in our statistical records of economic activities, it may be only the beginning of the contribution of electronic computers to economic time-series analysis.

The future course of time-series measurement will probably be along several different lines. First, electronic computers are reducing the cost of statistical editing and tabulation. While these processes do not represent most of the cost of statistical work, they do represent a significant portion. Consequently, it may be possible, with given budgets for statistical work, to fill gaps in existing information.

Major improvements may also be made in methods of measuring and eliminating the seasonal component of time series. Here the line of development may be in the direction of deriving seasonal adjustment factors from 12 lines of regression, one for each month of the year, fitted to (1) the original observations as the dependent variable, and (2) the corresponding values of a flexible trend-cycle curve of the original observations as the independent variable. In addition to new methods of measuring the seasonal factors, new methods of eliminating seasonal variations from the original series may also be developed. Measures of the variability of the seasonal indexes for each month and measures which relate the variability of the seasonal indexes to the magnitude of the month-to-month changes in

the seasonally-adjusted figures would also appear to be part of the new kit of seasonal measures.<sup>3</sup>

Next, new measures of the cyclical behavior of individual time series and of the relations among different series may also be developed. Thus, the relations of each important series, not only to a standard set of business-cycle turning dates such as the National Bureau of Economic Research reference dates, but perhaps to all other important series, may be calculated. Frickey's method of combining individual series may be applied, not only to his 13 quarterly series, but to a thousand monthly series. Indexes of the diffusion of cyclical movements, more sensitive than those now computed by the NBER, may come into existence.

Again, a host of new measures of the behavior of groups of individual reporting units in relation to their aggregate are now possible for many current economic series. Statistical collection agencies could present monthly measures of the dispersion of the rates of change in the activities of individual establishments in comparison to their average rate of change, frequency distributions showing the proportion of establishments

experiencing various different rates of change, partition values of rates of change, and similar measures of the anatomy of business-cycle indicators.

Finally, and perhaps most important of all, entirely new measures of economic events, which improve our power to predict future business fluctuations, may emerge. The potentialities for new types of economic time-series analysis appear to be limited only by the quality of the original observations, by the scope of human imagination, and by the capacity of the human mind to absorb information.

<sup>3</sup> For a fuller description of this regression method of seasonal adjustment, see "A New Multiplicative Seasonal Index," by the present writer, *Journal of the American Statistical Association*, December 1942, pp. 507-8, and the references cited in this article. For a discussion of alternative methods of eliminating seasonal variations, see *Measuring Business Cycles*, by Arthur F. Burns and Wesley C. Mitchell, National Bureau of Economic Research, 1946, pp. 52-54. Note that under the regression method of seasonal adjustment, as in the new method described by Burns and Mitchell, the relative seasonal factors are applied to the trend-cycle curve rather than the original observations.

TABLE 1

Seasonal Computations for Total Unemployment, United States:  
March 1940 to October 1954

Original observations derived from Census Bureau's Monthly  
Report on the Labor Force

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1. Original observations.												
1940	—	—	8360	8230	7990	8310	9150	8740	6850	7240	7260	6910
1941	7410	6930	6500	6350	5660	6190	6000	5620	4680	3840	3800	3620
1942	4320	4040	3580	3050	2590	2890	2830	2190	1680	1610	1630	1520
1943	1480	1420	1120	1010	950	1300	1390	1050	870	780	710	690
1944	810	690	690	630	730	880	890	680	600	440	500	500
1945	630	640	590	530	530	590	950	830	1650	1560	1740	1970
1946	2300	2650	2700	2330	2310	2570	2270	2060	2070	1960	1930	2120
1947	2400	2490	2330	2420	1960	2555	2584	2096	1912	1687	1621	1643
1948	2065	2639	2440	2193	1761	2184	2227	1941	1899	1642	1831	1941
1949	2664	3221	3167	3016	3289	3778	4095	3689	3351	3576	3409	3489
1950	4480	4684	4123	3515	3057	3384	3213	2500	2341	1940	2240	2229
1951	2503	2407	2147	1744	1609	1980	1856	1578	1606	1616	1828	1674
1952	2054	2086	1804	1612	1602	1818	1942	1604	1438	1284	1418	1412
1953	1892	1788	1674	1582	1306	1562	1548	1240	1321	1301	1699	2313
1954	3087	3671	3725	3465	3305	3347	3346	3245	3099	2741	—	—
2. Ratios of the original observations to the average of the original observations for the preceding and following months. (This is a test for the existence of seasonality in the original observations.)												
1940	—	—	—	1007	966	970	1073	1093	857	1026	1026	942
1941	1071	996	977	1049	901	1062	1016	1052	989	906	1019	892
1942	1128	1023	1010	989	872	1066	1114	971	884	973	1042	977
1943	1007	1092	922	976	823	1111	1183	929	951	987	966	908
1944	1174	920	1045	887	967	1086	1141	913	1071	800	1064	885
1945	1105	1049	1009	946	746	1203	1105	638	1381	920	986	975
1946	996	1060	1084	930	943	1122	981	949	1030	980	946	979
1947	1041	1053	949	1128	788	1125	1111	932	1011	955	974	891
1948	965	1172	1010	1044	805	1095	1080	941	1060	880	1022	864
1949	1032	1105	1016	934	968	1023	1097	991	923	1058	965	885
1950	1096	1089	1006	979	886	1079	1092	900	1055	847	1075	940
1951	1080	1035	1034	929	864	1143	1043	912	1006	941	1111	862
1952	1093	1081	976	947	934	1026	1135	949	996	899	1052	853
1953	1183	1093	993	1062	831	1095	1105	864	1040	862	940	967
1954	1032	1078	1044	986	970	1006	1015	1007	1035	—	—	—

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
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3. Twelve-month moving average of the original observations.

1940	—	—	—	—	—	—	—	—	7782	7627	7472	7278	7102
1941	6839	6579	6398	6115	5827	5552	5295	5054	4811	4533	4277	4002	
1942	3738	3452	3202	3017	2836	2661	2424	2206	2001	1831	1694	1562	
1943	1442	1347	1279	1210	1133	1064	1008	947	912	880	862	827	
1944	785	754	732	703	686	670	655	651	642	634	617	618	
1945	623	636	723	817	920	1042	1182	1349	1525	1675	1823	1963	
1946	2073	2176	2211	2244	2260	2272	2281	2267	2237	2244	2215	2214	
1947	2240	2243	2230	2207	2181	2141	2114	2126	2135	2116	2100	2069	
1948	2039	2026	2025	2021	2039	2064	2113	2162	2223	2291	2418	2551	
1949	2707	2853	2974	3135	3266	3395	3547	3699	3748	3790	3770	3738	
1950	3664	3565	3481	3345	3247	3142	2977	2788	2623	2475	2355	2238	
1951	2125	2048	1987	1960	1925	1879	1842	1815	1786	1775	1775	1761	
1952	1768	1770	1756	1729	1695	1673	1659	1634	1624	1621	1596	1575	
1953	1542	1512	1502	1504	1527	1602	1702	1859	2030	2186	2353	2562	
1954	2652	2819	2967	3087	—	—	—	—	—	—	—	—	

4. Centered twelve-month moving average of the original observations (two-month moving average of twelve-month moving average).

1940	—	—	—	—	—	—	—	—	7705	7550	7375	7190	
1941	6971	6709	6489	6257	5971	5690	5424	5175	4933	4672	4405	4140	
1942	3870	3595	3327	3110	2927	2749	2543	2315	2104	1916	1763	1628	
1943	1502	1395	1313	1245	1172	1099	1036	978	930	896	871	845	
1944	806	770	743	718	695	678	663	653	647	638	626	618	
1945	621	630	680	770	869	981	1112	1266	1437	1600	1749	1893	
1946	2018	2125	2194	2228	2252	2266	2277	2274	2252	2241	2230	2215	
1947	2227	2242	2237	2219	2194	2161	2128	2120	2131	2126	2108	2085	
1948	2054	2033	2026	2023	2030	2052	2089	2138	2193	2257	2355	2485	
1949	2629	2780	2914	3055	3201	3331	3471	3608	3709	3769	3780	3754	
1950	3701	3615	3523	3413	3296	3195	3060	2883	2706	2549	2415	2297	
1951	2182	2087	2018	1974	1943	1902	1861	1829	1801	1781	1775	1768	
1952	1765	1769	1763	1743	1712	1684	1666	1647	1629	1623	1609	1586	
1953	1559	1527	1507	1503	1516	1565	1652	1781	1945	2108	2270	2428	
1954	2577	2736	2893	3027	—	—	—	—	—	—	—	—	

5. Ratios of original observations to centered twelve-month moving average.

1940	—	—	—	—	—	—	—	—	889	959	984	961	
1941	1063	1033	1002	1020	948	1058	1106	1086	949	822	863	874	
1942	1116	1124	1076	981	885	1051	1113	946	798	840	925	934	



	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1943	985	1018	853	811	811	1183	1342	1074	935	871	815	817
1944	1005	896	929	877	1050	1298	1342	1041	927	690	799	809
1945	1014	1016	868	688	610	907	854	656	1148	975	995	1041
1946	1140	1247	1231	1046	1026	1134	997	906	919	875	865	957
1947	1078	1111	1042	1091	893	1182	1214	989	897	794	769	788
1948	1005	1298	1204	1084	867	1064	1066	908	866	728	777	781
1949	1013	1159	1087	987	1027	1134	1180	1022	903	949	902	929
1950	1210	1296	1170	1030	927	1050	1050	867	865	761	928	970
1951	1147	1153	1064	883	828	1041	997	863	892	907	1030	947
1952	1164	1179	1023	925	936	1080	1166	974	883	791	881	890
1953	1214	1171	1111	1053	861	998	937	696	679	617	748	953
1954	1198	1342	1288	1145	—	—	—	—	—	—	—	—

5.—Continued

6. Moving positional means of each successive five-term group of ratios for each of the months, omitting the highest and the lowest ratio from the computation of the mean in each case and using the same means for the first three years and the same means for the last three years.

1940	—	—	933	890	881	1107	1187	1020	917	844	868	875
1941	1027	1022	933	890	881	1107	1187	1020	917	844	868	875
1942	1027	1022	933	890	881	1107	1187	1020	917	844	868	875
1943	1027	1022	933	890	881	1107	1187	1020	917	844	868	875
1944	1045	1053	958	890	907	1123	1151	964	927	862	868	903
1945	1032	1048	946	911	910	1166	1184	979	927	847	826	861
1946	1032	1125	1058	1002	929	1127	1092	934	914	799	814	851
1947	1035	1172	1111	1039	929	1111	1081	934	906	873	848	891
1948	1077	1234	1154	1053	949	1111	1099	934	889	810	848	891
1949	1079	1203	1107	1034	896	1086	1099	921	885	821	869	888
1950	1108	1211	1107	981	910	1068	1094	916	880	820	904	922
1951	1174	1170	1087	981	908	1060	1071	901	880	820	904	943
1952	1191	1215	1115	1003	908	1060	1071	901	880	820	904	943
1953	1191	1215	1115	1003	908	1060	1071	901	880	820	904	943
1954	1191	1215	1115	1003	908	1060	1071	901	880	820	—	—

7. Centered preliminary moving seasonal adjustment factors—moving positional means adjusted to add to 1200.

1940	—	—	968	923	914	1148	1231	1058	951	875	900	907
1941	1065	1060	968	923	914	1148	1231	1058	951	875	900	907
1942	1065	1060	968	923	914	1148	1231	1058	951	875	900	907
1943	1063	1058	966	921	912	1146	1229	1056	970	874	899	906
1944	1076	1085	987	917	934	1157	1185	993	955	888	894	930
1945	1064	1081	976	939	938	1202	1221	1010	956	873	852	888
1946	1061	1156	1087	1030	955	1158	1122	960	939	821	837	875
1947	1041	1179	1118	1045	934	1118	1087	939	911	878	853	896
1948	1073	1229	1149	1049	945	1106	1095	930	885	807	845	887
1949	1089	1214	1117	1044	904	1096	1109	930	893	829	877	896
1950	1115	1219	1114	988	916	1075	1101	922	886	825	910	928
1951	1184	1180	1096	989	916	1069	1080	909	887	827	912	951
1952	1190	1214	1114	1002	907	1059	1070	900	879	819	903	942
1953	1190	1214	1114	1002	907	1059	1070	900	879	819	903	942
1954	1190	1214	1114	1002	907	1059	1070	900	879	819	—	—

8. Preliminary seasonally adjusted series.

1940	—	—	8636	8917	8742	7239	7433	8261	7203	8274	8067	7619
1941	6958	6538	6715	6912	6193	5392	4874	5312	4921	4389	4222	3991
1942	4056	3811	3698	3304	2834	2517	2299	2070	1767	1840	1811	1676
1943	1392	1342	1159	1097	1042	1134	1131	994	897	892	790	762
1944	753	636	699	687	782	761	751	685	628	495	539	538
1945	592	592	605	564	565	740	778	822	1726	1787	2042	2218
1946	2168	2292	2484	2262	2419	2219	2023	2146	2204	2387	2306	2423
1947	2305	2112	2084	2316	2099	2285	2377	2232	2099	1921	1900	1834
1948	1925	2147	2124	2091	1863	1975	2034	2087	2146	2035	2167	2188
1949	2446	2653	2835	2889	3638	3447	3693	3967	3753	4314	3887	3894
1950	4018	3842	3701	3558	3337	3148	2918	2711	2642	2352	2462	2402
1951	2114	2040	1959	1763	1757	1852	1719	1736	1811	1954	2004	1760
1952	1726	1718	1619	1609	1766	1717	1815	1782	1636	1568	1570	1499
1953	1590	1473	1503	1579	1440	1475	1447	1378	1503	1589	1882	2455
1954	2594	3024	3344	3458	3644	3161	3127	3606	3526	3347	—	—

9. Ratios of preliminary seasonally adjusted figures to average of the preliminary seasonally adjusted figures for the preceding and following months. (This is a test for residual seasonality.)

1940	—	—	—	1026	1082	895	959	1129	871	1084	1015	1014
1941	983	956	999	1071	1007	974	911	1085	1015	960	1008	964

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1942	1040	983	1039	1012	974	981	1002	1018	904	1029	1030	1047
1943	922	1052	950	997	934	1044	1063	980	951	1057	955	988
1944	1077	876	1057	928	1080	993	1039	993	1064	834	1082	935
1945	1048	989	1047	964	867	1102	996	657	1323	949	1020	1054
1946	961	985	1091	923	1080	999	927	1015	972	1059	959	1051
1947	1017	962	941	1107	912	1021	1052	997	1011	961	1012	959
1948	967	1061	1002	1049	916	1014	1001	999	1041	944	1026	949
1949	1011	1005	1023	893	1148	940	996	1066	906	1129	947	985
1950	1039	995	1000	1011	995	1007	996	975	1044	922	1036	1050
1951	952	1002	1030	949	972	1066	958	984	982	1024	1079	944
1952	993	1027	973	951	1062	959	1037	1033	977	978	1024	949
1953	1070	952	985	1073	943	1322	1014	934	1013	939	931	1097
1954	947	1019	1032	990	1101	934	924	1084	1014	—	—	—

9.—Continued

10. Twelve-month moving average of preliminary seasonally adjusted series.

1940	—	—	—	—	—	—	7824	7664	7497	7284	7130	
1941	6917	6671	6481	6157	5837	5535	5293	5066	4814	4514	4234	3994
1942	3779	3509	3246	3034	2833	2640	2418	2212	2001	1817	1668	1552
1943	1455	1365	1293	1214	1129	1053	999	941	902	868	846	815
1944	784	758	735	702	683	664	651	647	640	629	611	609
1945	612	623	715	822	946	1086	1217	1359	1515	1657	1811	1935
1946	2038	2149	2189	2239	2261	2278	2289	2274	2241	2245	2219	2224
1947	2254	2261	2252	2213	2179	2130	2099	2102	2105	2086	2066	2041
1948	2012	2000	2004	2013	2036	2065	2109	2151	2210	2276	2424	2547
1949	2685	2842	2976	3166	3309	3451	3582	3681	3754	3809	3784	3759
1950	3695	3590	3497	3334	3215	3091	2932	2782	2637	2487	2356	2248
1951	2148	2066	1997	1964	1926	1872	1840	1813	1785	1772	1773	1762
1952	1770	1773	1759	1727	1690	1669	1657	1637	1627	1625	1595	1577
1953	1547	1513	1502	1504	1530	1609	1693	1822	1976	2132	2316	2457
1954	2597	2782	2951	3097	—	—	—	—	—	—	—	—

11. Ratios of the uncentered twelve-month moving average of the preliminary seasonally adjusted series to the uncentered twelve month moving average of the original series. (This is a test of the extent to which the preliminary seasonal adjustment has resulted in differences between the averages of the adjusted and the unadjusted figures for each year, fiscal and calendar.)

1940	—	—	—	—	—	—	—	1005	1005	1003	1001	1004
1941	1011	1014	1013	1007	1002	997	1000	1002	1001	996	990	998
1942	1011	1017	1014	1006	999	992	998	1003	1000	992	985	994
1943	1009	1013	1011	1003	996	990	991	994	999	986	981	985
1944	999	1005	1004	999	996	991	994	994	997	992	990	985
1945	982	980	989	1006	1028	1042	1030	1007	993	989	993	986
1946	983	988	990	998	1000	1003	1004	1003	1002	1000	1002	1005
1947	1006	1008	1010	1003	999	995	993	989	995	986	984	986
1948	987	987	990	996	999	1000	998	995	994	993	1002	998
1949	992	996	1001	1010	1013	1016	1010	1003	1002	1005	1004	1006
1950	1008	1007	1005	997	990	984	985	998	1005	1005	1000	1004
1951	1011	1009	1005	1002	1001	996	999	999	999	998	999	1001
1952	1001	1002	1002	999	997	998	999	1002	1002	1002	1001	1001
1953	1003	1001	1000	1000	1002	1004	995	980	973	975	984	982
1954	979	987	995	1003	—	—	—	—	—	—	—	—

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
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# 13.—Continued

1942	1092	1071	1011	943	884	1109	1232	1043	858	878	961	943
1943	1003	1065	929	874	854	1204	1337	1040	925	900	867	900
1944	1113	976	970	884	992	1201	1234	1024	962	757	890	901
1945	1092	1107	1010	865	815	1282	1026	709	1153	908	875	938
1946	1026	1160	1161	998	1013	1161	1031	938	935	855	830	919
1947	1069	1108	1067	1111	878	1130	1165	960	908	845	837	845
1948	1040	1304	1202	1075	873	1087	1102	945	907	773	834	845
1949	1084	1238	1095	975	997	1071	1107	962	854	902	858	874
1950	1158	1232	1117	999	917	1080	1089	908	895	772	936	980
1951	1140	1171	1114	931	889	1122	1046	870	870	872	988	914
1952	1164	1237	1069	956	940	1046	1114	941	859	797	901	917
1953	1239	1169	1103	1059	877	1067	1068	839	847	739	847	1002
1954	1161	1234	1159	1042	987	985	980	968	—	—	—	—

- 14 Moving positional means of each successive five-term group of ratios for each of the months, omitting the highest and the lowest ratio from the computation of the mean in each case and using the same means for the first three years and the same means for the last three years.

1940	—	—	985	900	933	1130	1214	1071	920	873	907	908
1941	1072	1044	985	900	933	1130	1214	1071	920	873	907	908
1942	1072	1044	985	900	933	1130	1214	1071	920	873	907	908
1943	1072	1044	985	900	933	1130	1214	1071	920	873	907	908
1944	1070	1081	997	900	910	1189	1166	1001	941	878	877	919
1945	1062	1093	1016	919	908	1189	1143	974	941	867	860	907
1946	1067	1125	1079	986	914	1164	1099	948	935	824	849	888
1947	1064	1169	1108	1016	916	1126	1080	948	917	867	843	879
1948	1064	1210	1124	1024	931	1099	1099	948	903	824	843	879
1949	1098	1214	1109	1016	895	1096	1099	938	891	830	877	878
1950	1127	1236	1109	977	915	1079	1099	931	875	814	898	902
1951	1154	1213	1104	977	915	1073	1088	906	861	814	898	937
1952	1161	1212	1111	999	915	1064	1068	906	861	814	898	937
1953	1161	1212	1111	999	915	1064	1068	906	861	814	898	937
1954	1161	1212	1111	999	915	1064	1068	906	861	814	—	—

15. Centered final moving seasonal adjustment factors—moving positional means adjusted to add to 1200.

1940	—	—	989	903	936	1134	1218	1075	923	876	910	911
1941	1076	1048	989	903	936	1134	1218	1075	923	876	910	911
1942	1076	1048	989	903	936	1134	1218	1075	923	876	910	911
1943	1079	1051	991	906	899	1178	1205	1043	964	879	888	919
1944	1076	1087	1003	905	915	1196	1173	1007	947	883	882	924
1945	1073	1104	1026	928	917	1201	1155	984	951	876	869	916
1946	1078	1137	1090	996	923	1176	1110	958	945	832	858	897
1947	1070	1176	1114	1022	921	1132	1086	953	922	872	848	884
1948	1069	1215	1129	1028	935	1104	1104	952	907	828	847	883
1949	1103	1220	1114	1021	899	1101	1104	943	895	834	881	882
1950	1131	1240	1113	980	918	1082	1102	934	878	817	901	905
1951	1160	1219	1110	982	920	1078	1093	911	865	818	903	942
1952	1166	1217	1116	1004	919	1069	1073	910	865	818	902	941
1953	1166	1217	1116	1004	919	1069	1073	910	865	818	902	941
1954	1166	1217	1116	1004	919	1069	1073	910	865	818	—	—

16. Final seasonally adjusted series.

1940	—	—	8453	9114	8536	7328	7512	8130	7421	8265	7978	7585
1941	6887	6613	6572	7065	6047	5459	4926	5228	5070	4384	4176	3974
1942	4015	3855	3620	3378	2767	2549	2323	2037	1820	1838	1791	1668
1943	1372	1351	1130	1115	1057	1104	1154	1007	902	887	800	751
1944	753	635	688	696	798	736	759	675	634	498	567	541
1945	587	580	575	571	578	741	823	843	1735	1781	2002	2151
1946	2134	2331	2477	2339	2503	2185	2045	2150	2190	2356	2249	2363
1947	2243	2117	2092	2368	2128	2257	2379	2199	2074	1935	1912	1859
1948	1932	2172	2161	2133	1883	1978	2017	2039	2094	1983	2162	2198
1949	2416	2640	2843	2954	3659	3431	3709	3912	3744	4288	3869	3956

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
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# 16.—Continued

1950	3961	3777	3704	3587	3330	3128	2916	2677	2666	2375	2486	2463
1951	2158	1975	1934	1776	1749	1837	1698	1732	1857	1976	2024	1777
1952	1762	1714	1616	1606	1743	1701	1810	1763	1662	1570	1572	1501
1953	1623	1469	1500	1576	1421	1461	1443	1363	1527	1590	1884	2458
1954	2648	3016	3338	3451	3596	3131	3118	3566	3583	3351	—	—

17. Ratios of the final seasonally adjusted series to the average of the seasonally adjusted series for the preceding and following months. (This is a test for residual seasonality in the final adjusted series.)

1940	—	—	—	1073	1038	913	972	1089	905	1073	1007	1021
1941	970	983	961	1120	966	995	922	1046	1055	948	999	970
1942	1026	1010	1001	1058	934	1002	1013	983	939	1018	1022	1055
1943	909	1080	916	1020	953	999	1093	980	952	1042	977	967
1944	1087	881	1034	937	1115	945	1076	969	1081	829	1091	938
1945	1047	998	999	990	881	1058	1039	659	1322	953	1018	1040
1946	952	1011	1061	939	1107	961	943	1015	972	1062	953	1052
1947	1001	977	933	1122	920	1002	1068	988	1003	971	1008	967
1948	959	1061	1004	1055	916	1014	1004	992	1041	932	1034	960
1949	998	1004	1016	909	1146	931	1010	1050	913	1126	939	1010
1950	1024	986	1006	1020	992	1002	1005	959	1055	922	1028	1061
1951	973	965	1031	964	968	1066	952	974	1002	1018	1079	939
1952	1009	1015	973	956	1054	958	1045	1016	997	971	1024	940
1953	1093	941	985	1079	936	1020	1022	918	1034	932	931	1085
1954	967	1008	1032	995	1093	933	931	1064	1036	—	—	—

18. Twelve-month moving average of final seasonally adjusted series.

1940	—	—	—	—	—	—	—	7818	7662	7491	7284	7128
1941	6912	6670	6475	6151	5834	5533	5294	5064	4818	4511	4233	3995
1942	3778	3512	3241	3029	2831	2638	2418	2209	2002	1813	1671	1550
1943	1453	1367	1291	1211	1129	1052	1001	941	904	869	848	817
1944	784	757	734	702	682	665	651	647	637	627	608	609
1945	614	628	720	827	946	1061	1209	1355	1514	1661	1822	1942
1946	2044	2153	2191	2239	2259	2277	2286	2268	2236	2238	2207	2213
1947	2241	2245	2235	2200	2172	2130	2104	2109	2115	2095	2075	2051
1948	2021	2008	2010	2014	2034	2063	2103	2142	2199	2267	2415	2536
1949	2677	2833	2971	3163	3305	3452	3580	3675	3747	3800	3772	3747
1950	3681	3578	3488	3329	3214	3089	2939	2789	2641	2490	2359	2251
1951	2149	2071	2003	1970	1932	1874	1841	1820	1793	1779	1778	1767
1952	1776	1779	1763	1729	1691	1668	1657	1636	1627	1624	1597	1577
1953	1547	1513	1502	1504	1530	1610	1695	1824	1977	2133	2315	2454
1954	2593	2777	2948	3095	—	—	—	—	—	—	—	—

19. Ratios of the twelve-month moving average of the final seasonally adjusted series to the twelve-month moving average of the original series. (This is a test of the extent to which the final seasonal adjustment has resulted in differences between the averages of the adjusted and the unadjusted figures for each year, fiscal and calendar.)

1940	—	—	—	—	—	—	—	1005	1005	1003	1001	1004
1941	1011	1014	1012	1006	1001	997	1000	1002	1001	995	991	998
1942	1011	1017	1012	1004	998	991	998	1001	1000	990	986	992
1943	1008	1015	1009	1001	996	989	993	994	991	988	984	988
1944	999	1004	1003	999	994	993	994	994	992	989	985	985
1945	986	987	996	1012	1028	1037	1023	1004	993	992	999	989
1946	986	989	991	998	1000	1002	1002	1000	1000	997	996	1000
1947	1000	1001	1002	997	996	995	995	992	991	990	988	991
1948	991	991	993	997	998	1000	995	991	989	990	999	994
1949	989	993	999	1009	1012	1017	1009	1002	1000	1003	1001	1002
1950	1005	1004	1002	995	990	983	987	1000	1007	1006	1002	1006
1951	1011	1011	1008	1004	997	999	999	1003	1004	1002	1002	1003
1952	1005	1005	1004	1000	998	997	999	1001	1002	1002	1001	1001
1953	1003	1001	1000	1000	1002	1005	996	981	974	976	984	981
1954	978	985	994	1003	—	—	—	—	—	—	—	—

# QUESTIONS AND ANSWERS

Edited by ERNEST RUBIN

U. S. Department of Commerce  
and American University

## Problems in Accident Data

According to press reports, over 500 persons died in accidents during the two-day Christmas weekend in 1954. Of these deaths, 400 resulted from traffic accidents. Among the factors cited in connection with this record number of accident fatalities was the weather which was unseasonably warm over most of the country. The mild weather encouraged driving particularly for the purposes of family visiting and sight-seeing. Cold and inclement weather generally prevails at this time of the year and such weather is also cited as an important factor contributing to the high number of traffic accidents. It is of interest that the extremes in the weather at this season apparently influence the accident rate in a similar manner.

Factors contributing to accidents, particularly in the field of transportation are numerous; furthermore, these factors may be independent, inter-related, and in some cases, very difficult to characterize or categorize. There has been comparatively little discussion in print of the methodological problems in accident statistics. We wish to thank Mr. Libert Ehrman<sup>1</sup> for preparing the following discussion of statistical and related problems in accident data.

The largest group of accidental deaths which occur every year are those in transportation. The discussion which follows will deal primarily with problems related to development of valid data to be used as a basis for accident prevention. Chief among these are: determination of meaningful accident rates; establishment of adequate reporting procedures; creation of significant classifications for accident causes.

Major difficulties beset statisticians interested in devising accident rates. The special information needs of various groups and the obstacles to developing the data to meet these needs stand out. For example, the actuary's approach to transportation accidents differs from others.

With respect to insurance rates for travellers, the actuary shows concern for the *risk to all occupants* of a vehicle to involvement in an accident. Early in the history of railroading, this led to the development of accident rates based on *passenger miles* travelled. And because passenger mile rates have been so thor-

## Discussion by LIBERT EHRLMAN

oughly publicized, many, particularly among the general public, assume they are the only and, possibly the best measure of relative safety for all forms of transportation.

However, let us consider the viewpoint of the manufacturer of the vehicle. He wants to know how safe his vehicle is; he would like to make comparisons with similar vehicles. In the aircraft industry, for example, there is strong feeling that *airplane miles* or *airplane hours* are better indicators of exposure to accidents. (The analogy in other modes of transportation would be: train miles or train hours and automobile miles or hours.) To bolster their argument, these manufacturers suggest we remember that no relationship has been demonstrated between the chance number of occupants in a vehicle at a given time and the occurrence of an accident. To support this contention, they forward evidence that accident causes, by and large, are attributed to the person at the controls (driver, engineer, pilot), the condition of the vehicle, special characteristics of the "way" (road, rail, or air), and miscellaneous factors (such as acts of third persons: pedestrians who walk into the path of vehicles, etc.).

Still another outlook is that of organizations responsible for large-scale and varied vehicular operations. They would like to measure the relative safety of *specific missions or purposes*. To illustrate, the aviation branches of the armed forces would like to know the comparative hazards of training missions when there is an instructor aboard, of cross-country flying, of formation flying, and the like. In automobile transportation these missions might take the form of: pleasure driving, driving for the purpose of shopping, business driving, and the like. The railroads have conveniently separated their statistics into two segments according to purpose: passenger and industrial.

Some would like to relate accident rates to "phases of operation." For example, in aviation accidents, the highest proportion occurs during landing and takeoff. Some find reasons, therefore, that rates—at least for takeoff and landing accidents—should be based on the number of landings and takeoffs over a given time period for each specific model of aircraft. In automobile statistics, rates might be developed separately

<sup>1</sup> From January 1946 until November 1954, Mr. Ehrman was Chief of Safety Analysis, Office of Aviation Safety, Civil Aeronautics Administration. At present, Mr. Ehrman is an Associate of Samuel Weiss Research Associates, Washington, D. C.



for miles driven in short-haul, long-haul, within-city, and between-city operations.

Although consideration of the usefulness of the above yardsticks always produces a certain amount of excitement among technicians, their ardour cools when they discover the difficulties and expense of collecting basic data. However, rates of the type mentioned have such great value in systematizing and focussing safety programs that they should not be dropped from consideration simply because of such problems.

Those who are ingenious may discover the situation a challenge in which statistical tools could be applied to get the required answers. For example, the technique of sampling may provide an avenue leading to the required data. This is particularly true in vehicular transportation and military aviation, both of which are large enough to provide an adequate statistical base for sampling.

Unless a way is found for developing such rates, inadequate and inaccurate comparisons will continue to be made, simply because no other bases are available. Commercial airline operators, for example, argue that comparisons between air and rail accident rates are unrealistic simply because the yardstick for rail is that of the passenger mile. They claim this biases rates heavily in favor of rail transportation because so many persons are carried for every mile of train travel. Still others question whether it is valid to compare rail, air and vehicular transportation on a passenger mile basis, since the first two are public carriers operating for hire and the latter is, by and large, not.

What is required is a reexamination of the rate methods now used. The purposes and arguments for and against each method should be clearly established. Each rate basis has points of value as well as points of shortcoming. In any event, it appears that the first consideration should be not simply to accept existing types of rates as inevitable, but rather to consider them as historical precedents. They provide a basis for a more realistic and flexible view in which there is room for many types of rates. Each should be related to the type of need for information, whether it be actuarial, economic, or accident prevention programs.

Since accident report schedules provide the raw material from which prevention springs, their design requires enlightened attention. Too frequently, these reports rely almost solely on the circumstances surrounding the accident. That is, they contain a large number of questions about such facts as time and place of occurrence, weather, condition of the way, and the like. These are important, of course; but they tend to neglect information that fully establishes accident causes. For example, a driver may be held responsible for driving in the wrong lane at night—but little, if any, attention is given to such possible causes

as whether the driver was blinded by headlights of oncoming cars or lost control because he jammed on the brakes too hard, causing the wheels to skid. In vehicular accident reports, the main emphasis appears to be on determination of: (a) responsibility for legal claims, and (b) guilt for traffic violations. And such determinations are not always synonymous with discovering causes.

In the analysis and classification of causes of accidents, the statistician will have to show courage to probe deeply. Too frequently he has been directed to classify accidents according to a "single cause" for each. This practice has arisen from administrative insistence that the total number of causes exactly equal the number of accidents at the end of the year. But it is too much to expect that such arbitrary analyses will produce data which will approximate the reality of events involving human beings. Moreover, it is a statistical disservice to limit the number of categories of unsafe human acts, simply because: (a) the presence of such acts is more difficult to discern than, let us say, defective brakes; (b) descriptive language for such classifications is not easily arrived at; or (c) some safety administrators are not yet applying the information they already have.

The number and importance of accidents to the nation as a whole do not give us cause to rest easily. For example, the National Safety Council estimated the total cost of accidents in 1953 at 9.7 billion dollars. In the same year there were 9.6 million accidental injuries and 95 thousand accidental deaths, of which the largest number (about 40 thousand) occurred in transportation.

Responsibility for accident statistics and accident prevention cuts across many disciplines and various lines of administrative control. Study of the appropriate type of action to be taken at each level should be undertaken. Federal, state and municipal governments each have a part to play. Industry can take the lead in some areas; labor, insurance companies, and professional societies in others.

Because of the complexity of jurisdiction and the importance of accidents in our national life, some have suggested that our leading Foundations might supply the over-all technical exploration so critically needed. Under such auspices basic research could be undertaken into statistical techniques and statistical applications. They could make possible an interchange of ideas among those working on various aspects of the accident problem. They could bring together a cross section of the groups interested in accident prevention to develop new standards for accident reporting, accident rates, and cause classifications. With such direction, the tools for safety action could be sharpened and placed in the hands of safety administrators for application to a problem deeply in the national interest.

## NEWS ABOUT MEMBERS

**Willard O. Ash** has returned to his position as Assistant Professor, Department of Business and Public Administration, University of Maryland, after a year of graduate study in the Department of Statistics and Statistical Laboratory, Iowa State College.

**T. A. Bancroft**, director of the Statistical Laboratory, Iowa State College, has been on a three-month assignment during the fall quarter in the Near East and India, at the request of the Food and Agriculture Organization of the United Nations. The assignment has had two aspects: During the first six weeks he visited experiment stations and ministries of agriculture in Egypt, Syria, Iran and Iraq to collect information on the present use of experimental designs and survey techniques in research investigations. Since then he has given a program of seminars as one of the member lecturers at an Experimental Designs Training Center, supported by F.A.O. in New Delhi.

**E. H. Barnes** is now employed primarily as Counseling Psychologist, Veterans Administration Hospital, Downey, Illinois. He received a Ph.D. degree from Northwestern University in 1954.

**Marion D. Bingham**, formerly Assistant Chief of the Business Division, has been appointed Chief of the new Census Operations Division, Bureau of the Census.

**Elwood L. Bombara** is now completing courses for a master's degree in statistics at the Virginia Polytechnic Institute, and expects to finish in June 1955. Until September 1954 he had been working with Miss Besse Day, Mr. Del Priore and Mr. E. Sax in a cooperative student program at the U. S. Naval Engineering Experiment Station, Annapolis, Md.

**R. Buford Brandis**, who has been Executive Secretary of the Business Statistics Committee of the Chamber of Commerce of the United States, is joining the staff of the American Cotton Manufacturers Institute as Associate Economist.

**Hugh H. Brown**, research statistician for the California Taxpayers' Association and president of the Los Angeles Chapter of the American Statistical Association, has been elected a director of Western Governmental Research Association.

**Edward C. Bryant** returned to his position as Chairman of the Department of Statistics, University of Wyoming, in July after a year's study in the Department of Statistics, Iowa State College, during which he passed his doctoral preliminary examinations.

**Margaret K. Chandler** is now an associate professor of sociology at the University of Illinois, Urbana, Illinois. She is teaching an advanced course in quantitative methods and is doing research involving the application of some of these methods in the field of labor and industrial relations.

**Stewart Clare** is now Assistant Professor of Mechanical Engineering at the University of South Carolina.

**Edwin L. Crow** is now Mathematical Statistician for the Boulder Laboratories of the National Bureau of Standards, Boulder, Colorado. Formerly he was head of the Statistics Branch, Research Department, U. S. Naval Ordnance Test Station, China Lake, California.

**Owen Delap** has been appointed Chief of the Branch of Field Relations, Division of Manpower and Employment Statistics, Bureau of Labor Statistics. He was formerly Chief of the Reports and Analysis Section of the Arkansas Employment Security Division and later worked with the Bureau of Employment Security as a technician advising state agencies.

**Omar Dengo**, who has been serving as Technical Consultant in Statistical Coordination and Organization of the Inter-American Statistical Institute since July 1951, has returned to Costa Rica to teach at the University.

**William John Dixon**, formerly Agricultural Statistician, U.N. Food and Agricultural Organization Mission to Libya, is now engaged on research at the Statistical Laboratory, Department of Mathematics, University of California, Berkeley.

**Paul L. Dysart, Jr.** is now the sole proprietor and publisher of "The Trendway Stock Market Report", Louisville, Kentucky.

**Sidney Epstein** is a research associate in the Office of Scientific Personnel of the National Research Council, American Academy of Sciences. He is to assist in fellowship selection and is also in charge of a survey study of baccalaureate origins of doctorates in the sciences.

**Walter T. Federer** is on sabbatical leave from Cornell University from September 15, 1954 to September 15, 1955. Most of this time will be spent in the employ of the sugar and pineapple research organizations. He is Principal Statistician and head of the Department of Experimental Statistics, Experiment Station of the Hawaiian Sugar Planters Association, and Consultant in Statistics for the Pineapple Research Institute in Honolulu.

**D. J. Finney** is in charge of the Department of Statistics at the University of Aberdeen, Scotland. As director of the

newly established Agricultural Research Council Unit of Statistics, he hopes to provide a statistical service to all research institutes in agriculture or related fields in Scotland which care to make use of the unit.

**Herbert Ginsburg**, formerly with the Department of Experimental Statistics at North Carolina State College, has accepted a position with the Experimental Design and Statistical Analysis Group of Westinghouse Electric Corporation in East Pittsburgh, Pennsylvania.

**T. N. E. Greville**, formerly a statistician with the United States Operations Mission to Brazil, has been appointed Assistant Chief Actuary of the Social Security Administration in Washington, D. C.

**Walter E. Hoadley, Jr.**, who has held the position of Economist with Armstrong Cork Co. since the latter part of 1949, has been elected Treasurer of the Company.

**Joseph R. Hochstim** has joined the Human Resources Research Office, George Washington University, as Deputy Director of Research for the Psychological Warfare Division.

**Robert Hooke**, of the Analytical Research Group, Princeton University, has accepted a position, starting in July, as a research mathematician with the Westinghouse Research Laboratories, East Pittsburgh, Pennsylvania.

**Don G. Hopper** has resigned from active duty with the United States Army and has established an office, under the name of GRAFAX, in San Francisco, Calif. GRAFAX develops graphic presentations and is affiliated with Graphics Institute of New York.

**Edgar M. Jacobs**, associate in the Survey Group of the Statistical Laboratory, Iowa State College, has resigned to assume the position of Research Statistician with the General Foods Corporation, White Plains, New York. He received the Ph.D. degree in statistics in Iowa State College in the fall quarter of 1954, his thesis being entitled "A Statistical Technique for Estimating the Characteristics of Consumer Behavior".

**William J. Jaffe** has been promoted from Associate Professorship to Professorship and from Acting Executive Associate of the Department of Management Engineering of the Newark College of Engineering to Executive Associate of the Department.

**Ralph C. Janoschka**, formerly Chief of the Service Trades Technical Staff, Business Division, and more recently with the National Production Authority, has returned to the Census Bureau for a special assignment in the Office of the

Assistant Division Chief for Programs, Business Division.

**Irving Katz** has been awarded the Air Force Decoration for Exceptional Civilian Service. The award was based upon work performed while he was with Headquarters Strategic Air Command in Omaha, consisting of adaptation of actuarial methods to problems in engine performance. Savings to the Air Force have been estimated at several hundred million dollars to date. The presentation was made by Brigadier General John R. Burns, Commanding General of the Army Chemical Corps Research and Engineering Command, where he is now employed.

**Evelyn Kennedy** has been elected to junior membership in the Actors' Equity Association, after spending the summer with the Hilltop Theatre of Baltimore, Md. She will leave for New York shortly to continue her activities in the entertainment and theatrical field.

**Edward H. Kingsley** is an operations analyst for the Air Force at the Air Proving Ground Command, Eglin Air Force Base, Florida.

**Richard F. Link** has accepted a position as staff member with the Sandia Corporation, Albuquerque, New Mexico.

**Isador Lubin** has been chosen by Governor Averill Harriman to be the Industrial Commissioner in the new New York State Administration.

**Jerome Mark** has returned from Paris, where he was a member of the Bureau of Labor Statistics productivity team, to accept a position in private industry.

**Alvin Mayne** has taken leave from the Wharton School of Finance and Commerce, University of Pennsylvania, for a period of one or two years to act as a consultant to the Puerto Rican Planning Board in order to coordinate all the various statistical programs of the Commonwealth Government. He retains his consultation position with the Office of Defense Mobilization in Washington, D. C.

**Benjamin Mazeika** is employed as an analytical statistician at the Portsmouth Navy Shipyard, Portsmouth, N. H., working with the Budget and

Statistics Division of the Comptroller Department. He was formerly with the Human Nutrition Research Branch, A.R.C., U.S.D.A.

**Richard B. McHugh** was given a Ph.D. degree in statistics by the University of Minnesota in December 1954. His thesis is entitled "On the Scaling of Psychological Data by Latent Structure Analysis". Dr. McHugh has a joint appointment as Assistant Professor in the Department of Psychology and the Department of Statistics, Iowa State College.

**F. A. A. Menzler, C.B.E., F.I.A.**, has retired. He was formerly Chief Development and Research Officer of the London Transport Executive, in which position he directed the first London Travel Survey in 1949 and was also closely associated with the development of operational research methods. Mr. Menzler is a former President of the Institute of Actuaries and a Fellow of the Royal Statistical Society.

**Samuel J. Messick** has recently received a Ford Foundation Postdoctoral Fellowship for Research in Personality Dynamics and Development at the University of Illinois.

**Robert J. Meyer** is on leave of absence from the University of Rhode Island to study for a Ph.D. in Business Economics at Harvard University.

**William J. Moonan** is now Director of the Statistical Division of the U. S. Naval Personnel Research Field Activity, San Diego, California. He was formerly Assistant Professor of Educational Statistics and Research at the University of Minnesota.

**Stuart A. Rice**, who retired as Assistant Director for Statistical Standards, U. S. Bureau of the Budget, on December 31, is now associated with Samuel Weiss Research Associates, Washington, D. C. Dr. Rice was formerly U. S. Representative in the United Nations Statistical Commission, and has also served as President of the International Statistical Institute and the American Statistical Association. He remains a member of the Contributions Committee of the U. N. General Assembly.

**I. R. Savage** has taken leave of absence from the National Bureau of Standards, and is spending a year as a research associate at Stanford University.

**Ernest M. Scheuer** has received the degree of Master of Science in Mathematical Statistics at the University of Washington, and has returned from educational leave to his position as a mathematician at the U. S. Naval Ordnance Test Station, Pasadena, California.

**J. E. Keith Smith** has accepted a position as research psychologist at Lincoln Laboratory, Massachusetts Institute of Technology.

**George W. Snedecor** will serve as a consultant in experimental statistics for the Institute of Statistics, Consolidated University of North Carolina, for four months beginning January 1955. He will work primarily with staff of The Woman's College in Greensboro, and also with the staff of the Negro Agricultural and Technical College there. He will return to the Statistical Laboratory, Iowa State College, in May.

**Milton Sobel** is now a member of the Technical Staff of the Bell Telephone Laboratories. He is located at the Western Electric Company plant in Allentown, Pennsylvania. Part of his time is spent on life testing experiments with transistors; the remainder is spent on consultations and giving statistical instruction to the members of the plant.

**Vivian Eberle Spencer** has been appointed Assistant Division Chief for Mineral Industries, Industry Division, Bureau of the Census.

**Morgan R. Walker** has a new supervisory assignment in connection with the recently installed UNIVAC system, in the engineering department of the E. I. duPont de Nemours and Company, Newark, Delaware. He is concerned with the application of company business problems to this type of equipment.

**Gustave Zakrzewski**, formerly with the UNESCO Statistical Division in Paris, has joined the Statistical Division (IASI) of the Pan American Union in Washington, D. C.



## CHAPTER NOTES

### ALBANY

The special meeting of the Chapter held November 23rd to discuss the report of the Ad Hoc Committee on Statistical Standards (reported more fully in the NEWS Section of this issue) was followed in December by two luncheon meetings devoted to the same subject. Producers and consumers of statistics, as well as persons interested in professional standards in general, joined with the Executive Board at these meetings to add their point of view to the discussion.

On January 13th a joint dinner meeting with the Albany Section of the American Society for Quality Control was held. Dr. Robert De Sio, of the Applied Science Division of the International Business Machines Corporation, spoke on "Automation".

### BOSTON

At the November meeting, Professor Thomas F. Malone of M. I. T. gave a talk on his experiments in using statistical methods in weather research. By studying past weather in quantitative terms he hopes that some day meteorologists will be able to predict weather on a quantitative objective basis.

### CENTRAL NEW JERSEY

The speaker at the November 29th meeting was Harold O. Gulliksen, Professor of Psychology at Princeton University, Research Advisor at the Educational Testing Service, and a former president of the Central New Jersey Chapter. His subject was "Measuring Psychological Value".

### CHICAGO

A joint dinner meeting with the Chicago Chapter of the American Marketing Association was held on November 18th. Martin R. Gainsbrugh, Chief Economist of the National Industrial Conference Board, spoke on the "Economic Outlook for 1955". He pointed out the evidence of an upturn since mid-September, and said the problem of forecasting 1955 economic conditions amounts to forecasting to what degree the existing up-trend centered in inventory policy will spread to the basic end-product demand of business and consumer. He thought

that the prospects for an increase in consumer demand, at least, were good.

At the luncheon meeting on November 16th James H. Lorie, Associate Professor of Marketing at the University of Chicago, spoke on "A New Approach to Sales Forecasting". Joint luncheon meetings with the Chicago Chapter of the American Marketing Association were held on December 2nd and January 6th. The speaker at the first of these was John Howard, Assistant Professor of Business Administration at the University of Chicago and Vice-Chairman of the Chicago Section of the Operations Research Society, whose topic was "Operations Research Applied to Marketing Problems". At the January luncheon G. Herbert True, Professor of Marketing at Notre Dame, discussed "The Process of Creative Thinking".

The Chicago Chapter has begun a ten-week Statistics Review course covering basic concepts, the role of statistics in research, use and interpretation of averages and measures of variability, estimation techniques, sample design, analysis of time series, and other subjects. The instructor is William Barclay, who has taught courses in statistics at Chicago and Northwestern universities. A fee of \$15 is being charged for the course.

The first issue of a monthly Newsletter appeared in January. In addition to announcements of Chapter meetings and other activities of interest to area statisticians there is a section of news about members. The Newsletter is being written by volunteers under the direction of Harley C. Gates, Chairman of the Committee on Public Relations.

### CLEVELAND

"Sampling in a Variety of Fields" was the discussion subject of Walter J. Voorhis at a luncheon meeting of the Cleveland Chapter on November 23rd. Dr. Voorhis is a professor of mathematics at Fenn College and a member of the Operations Research Group at Case Institute of Technology. In his talk Dr. Voorhis outlined some of the basic sampling techniques and the reliability of inferences made from them. He discussed several applications of the use of sampling in the field of accounting: (1) estimating the volume of bad debts in accounts receivable, (2) estimating the allocation of joint revenues in railroad accounting, and (3) estimating price indices for the evaluation of LIFO inventories.

Probability design in sampling was discussed by Oliver S. Castle, Director

of Research for the A. C. Neilson Company, at a luncheon of the Cleveland chapter on December 16th. In his talk, Mr. Castle described the statistical designs used by his market research agency in setting up their national panels of homes and of retail stores. Neilson has a panel of homes scattered throughout the United States in which an audiometer is attached to the radio or television set in order to record the time and station schedules of family listening habits. Neilson further has a panel of retail grocery and drug stores throughout the country which are interviewed every two months to measure the movement of goods through the stores to the consumer. In both cases, Neilson panels have been chosen by the use of probability sampling:—a combination of stratified sampling to obtain maximum geographical dispersion, cluster sampling within strata and random sampling within clusters.

### DENVER

The subject of the November 18th meeting was "Statistical Standards". Highlights of the talk by Professor Edward Bryant of the University of Wyoming are reported in the NEWS Section of this issue. The speaker at the December 9th meeting was Eugene T. Halaas, Professor of Finance and Banking in the College of Business Administration, University of Denver. Dr. Halaas described the techniques and procedures used in a recent survey of the tax structure of the City and County of Denver, and summarized the results of that survey.

### HAWAII

At the annual meeting on November 17th the following officers were elected for the year 1954-55:

*President*, DR. ALBERT L. TESTER, University of Hawaii

*1st Vice-President*, FREDERICK S. W. LOO

*2nd Vice-President*, DR. RAYMOND FRANZEN, Hawaiian Pineapple Co.

*Secretary-Treasurer*, CHARLES F. CONGDON, University of Hawaii  
Following the business meeting Dr. William F. Royce spoke on "The Application of Statistical Methods to Fisheries."

A luncheon meeting was held on December 16th at which James Shoemaker of the Bank of Hawaii discussed the utilization of statistics by a regional economist. Mr. Shoemaker pointed out

that there has been since World War I an increasing localization of statistical studies and more emphasis on regional economics. In analyzing any regional economy three steps are followed—a basic statistical survey to map out the essential features of the economy, statistical analysis of problems and possibilities for growth (based on the first step), and the application of statistics in specific fields to present the practical operating and profit-making possibilities in specific forms of production. Mr. Shoemaker presented several graphs on the Hawaiian economy, illustrating the application of the statistical approach to a region.

## LOS ANGELES

A panel discussion on "Mathematical Statistics—Applications in Modern Industry" was held at the dinner meeting of December 2nd. Dr. Harry G. Romig, Quality Director of the International Telemeter Corporation, was chairman; and members of the panel included Dr. Leo A. Aroian, Computer Section of the Hughes Aircraft Co., and Edward P. Martin, Quality Control Manager of the Adel Division of General Motors.

## NEW YORK

The November 17 meeting was devoted to an educational picture on Electronic Computer Data Processing Systems which was followed by a tour of the Computing Service Bureau Center at the Remington Rand Building, 315 Fourth Avenue, New York City. The topic for the December 8th meeting, which was jointly sponsored by the Biostatistics and Statistical Techniques Sections, was "Long Range Follow-Up Studies". Gordon Shellard of the Metropolitan Life Insurance Co. described the results of the 1951 Impairment Study, and Dr. Joseph Zubin, New York State Psychiatric Institute, discussed "Patient Mobility as a Factor in the Prognosis of Mental Disorder". Morton Kramer of the National Institute of Mental Health led the discussion.

## OKLAHOMA CITY

Dr. Solis Kates of the University of Oklahoma spoke on "The Development of a New Leadership Test—Based on the Correlation between Leadership, Ability and Attitudes" at the meeting of November 3rd. Basic hypotheses were that leaders in a particular group subscribe more fully to the values of that group than do non-leaders, and that the values of the leaders are more homogeneous with respect to one another than are those of the non-leaders. Two questionnaires were used with a religious organization which included 46 University of Oklahoma students. The first was designed to measure the individual member's values, while the second measured the effective participation of each individual within the group.

The meeting of December 1st, which was devoted to a panel discussion on the formulation of statistical standards, is reported in the NEWS Section of this issue.

## ST. LOUIS

At the November 17th luncheon meeting Seymour T. R. Abt, Divisional Operating Manager, Stix, Baer and Fuller, spoke on "The Place of Statistics in Retail Operating Problems". Mr. Abt, a founding member of the Operations Research Society, demonstrated how operations research methods have solved problems in retail stores. The December 15th luncheon meeting heard Carl A. Dauten, Professor of Finance at Washington University, discuss "Current Methods of Forecasting Business Activity". Dr. Dauten, who has recently published a textbook on Business Fluctuations and Forecasting, described some of the successful methodologies used to obtain an accurate forecast of business activity.

Dr. Arthur C. Myers, Associate Professor of Economics, St. Louis University, and Consultant to the Board of Commissioners, St. Louis Police Department, was elected President of the St. Louis Chapter at its December meeting. Dr. Myers will serve for the years 1955 and 1956. Richard E. Edgar, Re-

search Department, Social Planning Council of St. Louis and St. Louis County, was elected Secretary for the next two years. Dr. Werner Z. Hirsch, Department of Economics, Washington University, and George S. Little, Statistical Analyst, Southwestern Bell Telephone Company, will continue to serve during 1955 as Vice President and Treasurer respectively.

The St. Louis Chapter is inaugurating a series of special luncheon meetings dealing with problems in sampling. The first of these meetings, which are to be held on the first Wednesday of each month, was on January 5th. The speaker was James H. Batchelor, Management Consultant, who discussed the case history of an application of sampling methods to accounting and auditing problems arising in connection with an operations research project.

## WASHINGTON

The subject of the November 22nd meeting was "Diffusion Indexes". Geoffrey H. Moore, Associate Director of Research for the National Bureau of Economic Research, described the underlying principles and potential applications of these measures of the diffusion of cyclical movements in the economy. Grover W. Ensley, Staff Director of the Joint Committee on the Economic Report, was chairman of the meeting, and Arthur L. Broida of the Division of Research and Statistics, Board of Governors of the Federal Reserve System, was discussant.

A joint meeting with the Washington Chapter of the American Association for Public Opinion Research was held on December 20th to discuss the UNIVAC and election returns. Max A. Woodbury, Principal Investigator, Logistics Research Project (ONR), George Washington University, spoke on "Estimation of Election Outcomes from Early Returns". Churchill Eisenhart, Chief of the Statistical Engineering Laboratory of the Bureau of Standards, was chairman, and Morris H. Hansen, Assistant Director for Statistical Standards of the Bureau of the Census, was discussant.

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### NEW BUFFALO—NIAGARA CHAPTER

The Board of Directors recently granted a charter to the new Buffalo-Niagara Chapter. On December 7, 1954 an organization meeting was held and the following officers were elected:

*President:* Zenon Szatrowski, University of Buffalo

*Vice-President:* Robert Mirsky, Cornell Aeronautical Laboratory

*Secretary:* Richard Schmidt, University of Buffalo

*Treasurer:* Melvin D. Fimple, University of Buffalo

For information regarding meetings and other activities of the chapter, please contact Mr. Schmidt at the University of Buffalo, Buffalo 14, New York.

### MATHEMATICIAN—STATISTICIAN

Challenging position at our Baton Rouge location heading up program on computer applications to chemical research, engineering and manufacturing problems. Will also serve as expert on statistical design of research and development experimental programs, and the general application of mathematical techniques and models.

Applicant should have strong engineering or physical science background and familiarity with digital computer programming. Advanced degree (or equivalent experience) in (1) mathematics or statistics, or (2) engineering or physical science is required. Ability to cooperate in a team approach to problems is essential.

Submit transcript and resume to:

**R. S. Asbury**

**Ethyl Corporation, Box 341, Baton Rouge, Louisiana**



